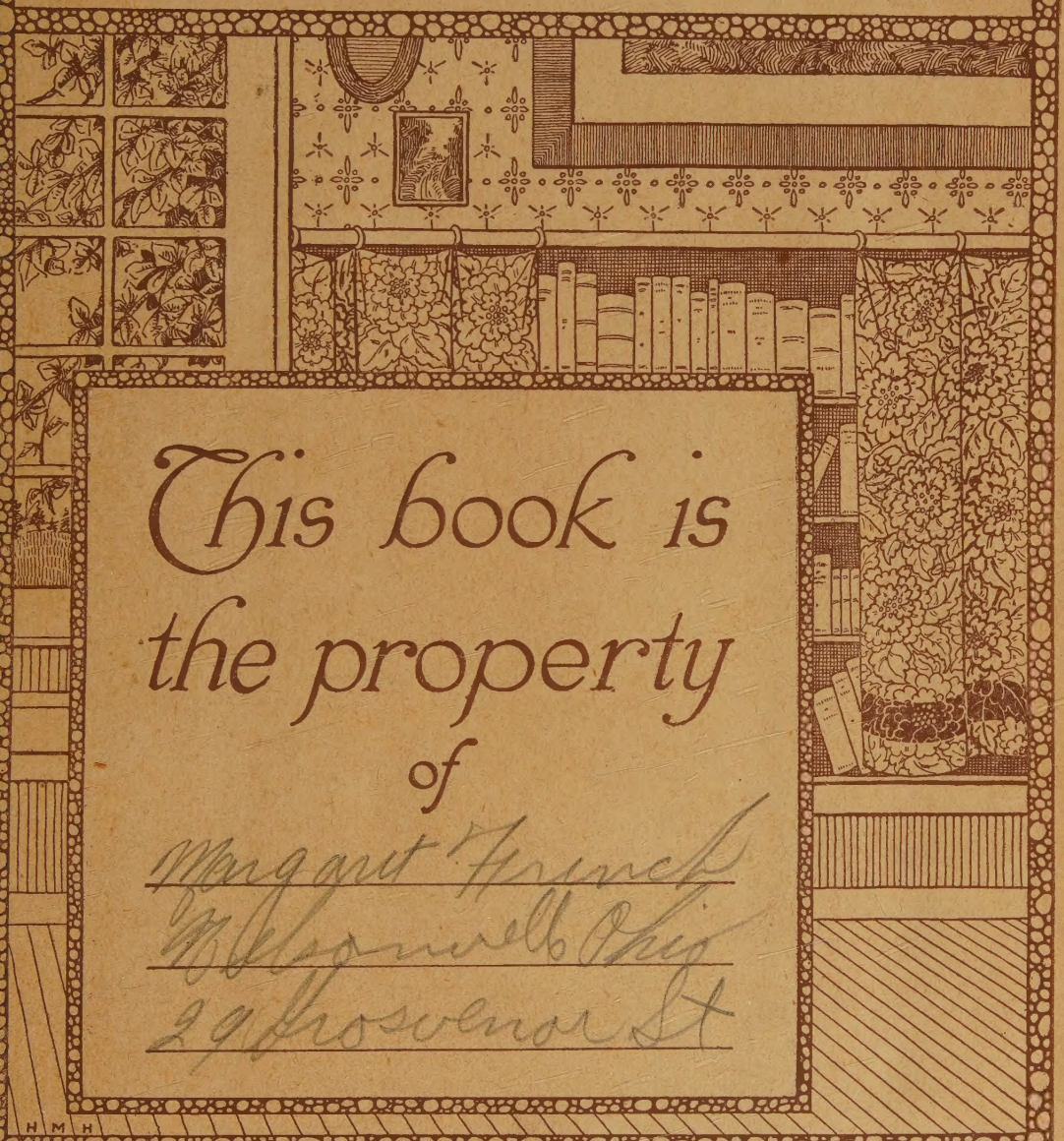
THE AMERICAN EDUCATOR

PRACTICAL HELP IN HOME AND SCHOOL

AMERICAN

Education commences at the mother's knee, and every word spoken within the hearing of little children tends towards the formation of character. —*Ballou*

EDUCATOR



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Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it.
— Samuel Johnson

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THE AMERICAN EDUCATOR

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PREFACE

THE AMERICAN EDUCATOR has been made particularly for the millions of boys and girls in school and home and also for those whose interest in the education of young people is a vital element in their lives. The editors and publishers were guided in its preparation by the rich experience of years gained in contact with its predecessor, which for a decade had upheld a new standard of excellence for works of its kind; and through which in far greater degree than ever before the necessities of young students had been recognized and met.

It may be stated with emphasis that THE AMERICAN EDUCATOR is a new production. The world upheaval, from 1914 to 1919, wiped out thousands of long-established facts, and in their places imposed other stubborn realities whose prompt recognition was imperative. Merely to revise a reference work in the face of such tremendous new currents of events and thought was found impossible, unless thoroughness and adequacy of treatment were to be sacrificed. A new world emerging from the stress of war which came close to consuming the entire economic structure of the strongest nations could not be portrayed in the same space that had hitherto been sufficient.

An entirely new reference work was thus forced into being, but we well knew that its prompt acceptance by the people could be assured only if it mirrored the excellent features which had made its predecessor the outstanding work of its kind. Therefore, in presenting THE AMERICAN EDUCATOR, the editors and publishers offer a completely remodelled set of books, rewritten from the original text, enlarged to meet new demands, and with new plans and devices helpful alike to pupils, parents and teachers. While intended primarily for these particular groups, THE AMERICAN EDUCATOR will be found of inestimable value to those busy people in every occupation who desire concise and direct information not easily accessible elsewhere.

Accuracy, balance, convenience and clearness are essential characteristics of a reliable reference work; the editors feel that the text of these volumes conforms in a notable degree to these requirements. To secure balance and accuracy, the work was divided into over forty departments, such as geography, pedagogy and education, biography and history. These departments were given to qualified editors, who

worked under careful supervision and who finally brought together the thousands of articles which they had written and adjusted them in harmony with the proportions of the work. The editors have not relied solely upon their own experience and judgment, but have had the advice and assistance of business men and educators from every state in the Union. The latest information has been secured through letters addressed to prominent persons in important towns and cities. The state articles have been reviewed by notable persons possessing full information concerning their own states. Statistics have been compiled from the very latest reports, provided they had the merit of strict reliability, and the narrative of events is brought to the eve of publication.

The department of pedagogy and education has been wrought out more fully than was ever before attempted in any work of this kind, and consists of practical articles on psychology, the history of education and methods of teaching; information concerning important universities, colleges and other educational institutions; brief accounts of educational systems in states and countries, and a large number of biographies of men who are prominent in educational affairs. Geography is the largest department, but others, such as natural history, law and politics, art, literature, music and mechanic arts, have been given space and consideration adequate to their great demands.

The language is direct and simple, technicalities of all sorts have been studiously avoided, and it is felt that almost any child can read an article and understand its contents. Nevertheless, scientific accuracy has not been sacrificed.

To make the work convenient in use, the long articles have been divided by conspicuous subheads. Moreover, the greatest care has been taken to arrange material under the most common and appropriate headings; in other words, to place it in the spot where it will be oftenest sought. At the same time references are made to it from all other related articles. This system of cross-references binds together, also, the material of every department, and enables the reader to find quickly anything related to the subject he seeks. The complete index at the end of the last volume leads to every important fact referred to in the entire work. By following the references one is led into broad courses of systematic reading.

The publishers have admirably embellished the work with the finest multi-colored illustrations, new engraved colored maps and vivid relief maps of the continents; choice full-page, colored halftones; new and correct pen and ink portraits, and more than eighteen hundred

other pictures. As all have been selected primarily for the important purpose of clarifying and broadening the text, they form an integral part of the work.

In appearance, the volumes are a notable improvement upon other works of reference of similar size, and in one respect are unique, namely, in the use of large, clear type. In a large encyclopedia that is rarely consulted, and then only for brief moments, one might possibly justify all articles in small type, but a useful book for daily reference by young students and busy people should make no unnecessary demands on the eyesight, or waste valuable time with crowded lines.

The editors have felt the responsibility which has rested upon them, and they have spared no effort to make THE AMERICAN EDUCATOR a work of value to inquirers of all classes, a work that scholars will appreciate.

E. D. F.

CHICAGO, *October 2, 1919.*

PRONUNCIATION

The pronunciation of titles is indicated by accenting the word or by respelling it phonetically in italics. In the phonetic spelling, letters are used to indicate the sounds which they most commonly represent.

A vowel is *short* when followed by a consonant in the same syllable, unless the syllable ends in silent *e*.

A vowel is *long* when standing alone or in a syllable which ends in silent *e* or when ending an accented syllable.

S is always soft, and never has the sound of *z*.

The foreign sounds which have no equivalent in the English language are represented as follows:

K for the German *ch*, as in Bach: (**Bach**, *baK*).

N for the French *n*, as in Breton: (**Breton**, *bre toN'*).

ö for the German *ö*, as in Göttingen: (**Göttingen**, *gö'ting en*).

ü for the German *ü*, as in Blücher: (**Blücher**, *blüK'ur*).

A

A, the first letter in almost all alphabets. In its primary sound, that of *a* in *father*, it is the purest of the vowels and is produced with the entire vocal channel in the most open position possible. Most modern languages, as French, Italian and German, have only one sound for *a*, namely, that heard in *father*, but in English this letter is made to represent eight sounds, as in the words *father, mat, mate, mare, final, ball, what* and *ask*, besides being used in such digraphs as *ea* in *heat* and *oa* in *boat*. For other details, see the article ORTHOGRAPHY.

A, in music, is the sixth note in the diatonic scale of C, and when in perfect tune stands to the latter note in the ratio of 3/5 to 1 (see MUSIC). The second string of the violin is tuned to this note.

A1, Aa1 and **AA1**, used as symbols by Dun, Bradstreet and other financial agencies to indicate a high rating. A after a firm's name means resources of $500,000 to $750,000; Aa means $750,000 to $1,000,000; AA means over $1,000,000. The numeral 1 shows that the credit rating is of the best. In popular usage the expression A1 has come to mean excellence of any kind.

AACHEN, *ah'ken*, the German name for Aix-la-Chapelle (which see).

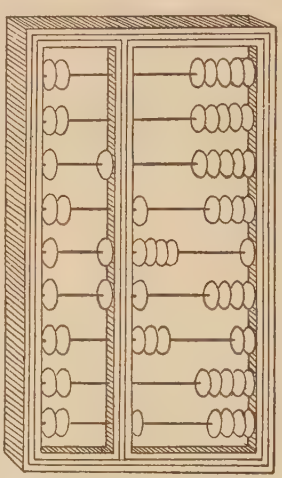
AARD-VARK, *ahrd vahrk*, an ant-eater found in South Africa. It is a stout animal, with long piglike snout, tubular mouth, the usual termite-catching tongue, large ears, fleshy tail and short, bristly hair. The limbs are short and very muscular; on the fore feet are four, on the hind five, powerful claws, used in burrowing and in excavating the hills of the white ants on which it feeds. It is nocturnal in its habits and is very inoffensive and timid. When pursued, it can burrow itself out of sight in a few minutes, working inward with such rapidity as to make it almost impossible to dig it out. Its total length is about five feet, of which the tail is about one foot nine inches. Its dwelling is a burrow at a little distance from the surface, and thence it may be observed creeping at dusk. The flesh is considered a delicacy by the natives.

AARD-VARK

AARD-WOLF, a South African carnivorous animal, foxlike in size and habit, but having longer ears and a less bushy tail. It resembles a hyena in its sloping back and in its color, the body being gray, irregularly striped with black, but it has five toes on the fore feet, and the head is much more pointed and civetlike. It feeds on carrion, white ants and the like, but not on living vertebrates. It is timid and nocturnal in its habits, social but quarrelsome in its life, and tolerably swift in its pace, though usually trusting rather to burrowing than to flight.

AARON, *ar'un*, the elder brother of Moses, always second to him in command, but the first and one of the greatest of the Israelitish high priests. He acted as spokesman for Moses when the latter delivered the Israelites from the Egyptians, and he was one of the leaders of the nation in its wanderings. When Moses was on Mount Sinai, Aaron made the golden calf which the Israelites worshiped. Aaron was not allowed to enter Canaan, but died and was buried on Mount Hor. See *Ex.* XXIX; *Num.* XVI and XX, 8–13.

AB'ACUS, a calculating machine used in teaching the elements of number. It consists of a rectangular frame which holds parallel rods upon which beads or balls are strung. A handle is attached to the lower side of the frame, so that when the abacus is in use the rods are held in a horizontal position. The ancient abacus contained vertical columns which corresponded to the order of figures, as units, tens and hundreds. This instrument was in general use among the Greeks and Romans, and is still employed in Persia and other countries of the Far East for reckoning purposes. The Chinese abacus is called *shwanpan,* which means *reckoning board.*



CHINESE ABACUS

ABALO'NE, or **EAR SHELL**, a Californian mollusk, of which there are several species. The shell is a very broad spiral that resembles a shallow dish lined with bright mother-of-pearl, and has considerable commercial value. The animal, which moves about over rocks at the bottom of the sea near the shore, is an important article of food for the Chinese and other Oriental peoples. Quantities are collected and dried on the California shore. The people of that state use large numbers, and the rest are exported.

AB'BEY, a monastery or religious community governed by an abbot; or in the case of a female community, by an abbess. The difference between a priory and an abbey is that the former is a less extensive establishment and is governed by a prior. Among the most famous abbeys in Europe are those of Cluny and Clairvaux in France, the Abbey of Saint Galle in Switzerland, and Fulda in Germany. Among the famous English abbeys are those of Westminster, Tintern, Paisley and Saint Mary's of York. At the time of the Reformation the abbeys in England were destroyed by Henry VIII.

ABBEY, EDWIN AUSTIN (1852–1911), an American painter, born in Philadelphia. He studied in the United States, but lived in England after 1881. A series of canvases entitled *The Quest of the Holy Grail,* in the Boston Public Library, and a group of historical paintings in the Pennsylvania state capitol are his most noteworthy productions. As a colorist and intellectual painter, Abbey ranks among the foremost American artists.

AB'BOT, a prelate of high rank in the Roman Catholic Church, who governs a convent or monastery. The first abbots were laymen, but priestly abbots appeared in the Western Church in the seventeenth century and have continued to the present day. Their powers were at first limited, but as the abbeys grew in wealth the abbots grew in power, until they came to be ranked next to bishops as prelates of the Church and had the right to vote in Church councils. Abbots are elected by the assembly of monks, and the election is confirmed by the Pope or the bishop, who has direct control over the monastery. See ABBEY.

Abbess, the mother superior of a community of nuns. In rank and authority she corresponds to an abbot, but she cannot exercise any of the priestly functions.

AB'BOTSFORD, the former country seat of Sir Walter Scott, on the south bank of the Tweed, near Melrose Abbey, twenty-eight miles southeast of Edinburgh, Scotland. In 1811 it was purchased by Scott

ABBOTSFORD

and given its name because it was located near a ford which was formerly used by the abbots of Melrose. It stands in the midst of picturesque scenery, forming an extensive and irregular pile in the Scottish baronial style of architecture. It has been appropriately described as a "romance in stone."

ABBOTT, JACOB (1803–1879), a popular American writer of books for the young.

He was a teacher and subsequently a clergyman, but after 1839 he devoted himself entirely to writing. Of his two hundred volumes, the best-known are the *Rollo Books* and the *Franconia Stories*. He also wrote numerous biographies for children.

ABBOTT, John Joseph Caldwell, Sir (1821–1893), a Canadian statesman, born at St. Andrew's, Quebec. He was educated at McGill University, where later he became dean of the faculty of law and one of the governors. His first appearance in public life was in 1857, when he contested the representation of his native county of Argenteuil; after an investigation that lasted two years he obtained the seat and was successively reëlected till 1874. In 1862, as solicitor-general, he introduced the use of stamps in the payment of judicial and registration fees in Lower Canada, he remodeled the jury law, and he drafted and carried through parliament an insolvency act which is the basis of Canadian law today. From 1887 to 1889 he was mayor of Montreal and at the same time a member of the Dominion Senate. In the Cabinet of Sir John Macdonald he became a member without portfolio, and after Macdonald's death in 1891 became premier. Old age and the cares of office overburdened him, however, so that he resigned on December 5, 1892. (For portrait, see illustration facing article Premier.)

ABBOTT, Lyman (1835–), an American clergyman and editor, widely known as the editorial head of *The Outlook*. He is the son of Jacob Abbott, and was born in Massachusetts. He was graduated at the University of New York in 1853 and was admitted to the bar. Later he studied theology, and was ordained in the Congregational Church in 1860. For five years he preached in Terre Haute, Ind., and afterward was pastor of the New England Church in New York City, but resigned in 1869. Dr. Abbott edited the "Literary Record" of *Harper's Magazine* and the *Illustrated Christian Weekly*, and was associated with Rev. Henry Ward Beecher on the *Christian Union*, afterward becoming editor in chief. In 1889 he became pastor of Plymouth Church, Brooklyn, where he remained for ten years. In 1893 he became editor in chief of *The Outlook*, the successor of the *Christian Union*, and he did much to give that periodical its distinguished place among American journals. Dr. Abbott wrote a *Life of Henry Ward Beecher* and edited Beecher's sermons. He also contributed frequently to leading magazines, upon religious themes.

LYMAN ABBOTT

ABBREVIATIONS, shortened forms of words, or of arbitrary signs or symbols substituted for words. The most common method of abbreviating is the substitution of the initial letter for the word itself, but one or more letters are often added to prevent ambiguity. Abbreviations were in common use among the Greeks and Romans, and in the manuscripts of the Middle Ages they were so numerous as to render some works exceedingly difficult to read. Even after printing was invented, the excessive use of abbreviations continued for a time.

The following brief list contains many of those abbreviations that are not easily recognized:

A. B. Artium Baccalaureus, Bachelor of Arts.
A. D. Anno Domini, in the year of the Lord.
ad lib. ad libitum, at pleasure.
Ala. Alabama.
Alas. Alaska.
A. M. Ante meridiem, before noon; Ars Magister, Master of Arts.
Ari. Arizona.
Ark. Arkansas.
Ave. Avenue.
B. A. Baccalaureus Artium, Bachelor of Arts.
B. C. Before Christ; British Columbia.
B. D. Baccalaureus Divinitatis, Bachelor of Divinity.
B. M. Baccalaureus Medicinae, Bachelor of Medicine.
B. S. Bachelor in the Sciences.
B. V. Beata Virgo, Blessed Virgin; Bene vale, farewell.
B. Y. P. U. Baptist Young People's Union.
Calif. California.
C. E. Civil Engineer.
C. J. Chief Justice.
C. M. Common meter.
C. O. D. Cash (or collect) on delivery.
Col. or Colo. Colorado.
Con. Contra, against, in opposition.
Conn. or Ct. Connecticut.
Cf. Confer, Compare.
Cr. Credit, creditor.

C. S. A. Confederate States of America; Confederate States Army.
Ct. Connecticut; court.
Dak. Dakota.
D. C. Da Capo, from the beginning—in music it means repeat; District of Columbia.
D. D. Divinitatis Doctor, Doctor of Divinity.
Dec. December; declination.
Deg. Degree; degrees.
Del. Delaware; delegate; delineavit, he (or she) drew it.
Dept. or Dpt. Department.
do. Ditto, the same.
D. P. Doctor Philosophiae, Doctor of Philosophy.
Dr. Debtor; doctor; drachms.
D. Sc. Doctor of Science.
D. V. Deo volente, God willing.
E. East.
E. G. Exempli gratia, for example.
Esq. Esquire.
et al. Et alii, and others.
etc. or &c. Et cetera, and others, and so forth.
et seq. Et sequentes, et sequentia, and what follows.
Fahr. or F. Fahrenheit.
Fla. Florida.
f. o. b. Free on board.
Fol. Folio.
Ga. Georgia.
G. A. R. Grand Army of the Republic.
G. B. Great Britain.
Gov. Gen. Governor General.
G. P. O. General Post-office.
H. I. Hawaiian Islands.
H. J. S. Hic jacet sepultus, here lies buried.
Ia. Iowa.
Ib. or ibid. Ibidem, in the same place.
Ida. Idaho.
i. e. Id est, that is.
Ill. Illinois.
Ind. Indiana, index.
Inst. Instante mense, this month.
I. O. U. I owe you.
Jr. Junior.
Kan. Kansas.
K. C. B. Knight Commander of the Bath.
Ky. Kentucky.
La. Louisiana.
Lat. Latitude.
lb. or lbs. Libra or librae, pound or pounds in weight.
L. I. Long Island.
Lieut. or Lt. Lieutenant.
LL. B. Legum Baccalaureus, Bachelor of Laws.
LL. D. Legum Doctor, Doctor of Laws.
LL. M. Legum Magister, Master of Laws.
M. A. Master of Arts; Military Academy.
Mass. Massachusetts.
M. B. Medicinae Baccalaureus, Bachelor of Medicine; Musicae Baccalaureus, Bachelor of Music.
M. C. Member of Congress; Master of Ceremonies; Master Commandant.
Md. Maryland.
M. D. Medicinae Doctor, Doctor of Medicine.
Mdse. Merchandise.
Me. Maine.
M. E. Methodist Episcopal; Military or Mechanical Engineer.
Messrs. Messieurs, Gentlemen.
Mex. Mexico, or Mexican.
Mich. Michigan.
Minn. Minnesota.
Miss. Mississippi.
Mlle. Mademoiselle.
Mme. Madame, Madam.
Mo. Missouri; month.
Mont. or Mon. Montana.
M. P. Member of Parliament.
Mr. Mister.
Mrs. Mistress.
M. S. Master of Science; Memoriae sacrum, sacred to the memory.
MSS. Manuscripta, manuscripts.
N. B. New Brunswick; North Britain (that is, Scotlahd); North British (that is, Scotch); Nota bene, mark well, take notice.
N. C. North Carolina.
N. E. New England; northeast.
Neb. Nebraska.
Nev. Nevada.
N. H. New Hampshire.
N. J. New Jersey.
N. M. New Mexico.
No. or no. Numero, number.
N. Y. New York.
O. Ohio.
O. K. (Jocular). All right or correct.
Okl. Oklahoma.
Or. or Ore. Oregon.
O. T. Old Testament.
oz. Onza, ounce.
P. or p. Page; part; participle; pondere, by weight.
Pa. Pennsylvania.
Per cent. Per centum, by the hundred.
Ph. B. Philosophiae Baccalaureus, Bachelor of Philosophy.
Ph. D. Philosophiae Doctor, Doctor of Philosophy.
P. I. Philippine Islands.
P. M. Post meridiem, afternoon, evening; Past Midshipman; postmaster.
P. O. Post-office; Province of Ontario.
Port. Portugal, or Portuguese.
pp. Pages.
Pres. President.
Prof. Professor.
pro tem. Pro tempore, for the time being.
Q. E. D. Quod erat demonstrandum, which was to be proved.
R. I. Rhode Island.
R. R. Railroad.
R. S. V. P. Repondez s'il vous plait, answer, if you please—please reply.
Ry. Railway.
S. A. South America; South Australia.
S. C. South Carolina; Supreme Court.
Sc. B. Scientiae Baccalaureus, Bachelor of Science.
S. D. South Dakota.
Sr. Senior.

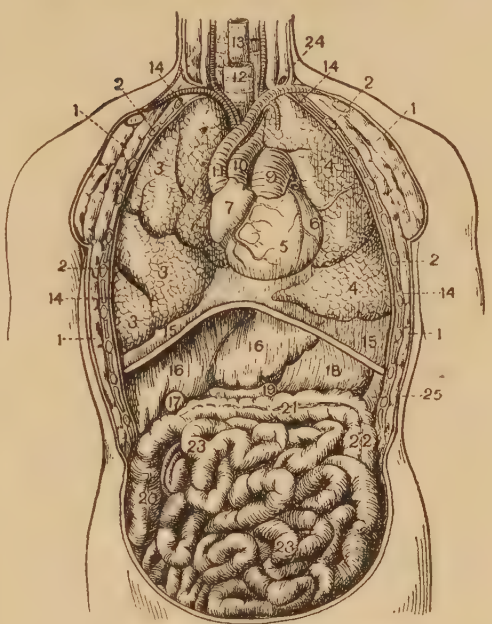
Syn. Synonym; synonymous.
Tenn. Tennessee.
Ter. Territory.
Tex. Texas.
Th. or Thurs. Thursday.
Treas. Treasurer.
Ult. Ultimo, last; of the last month.
U. S. A. United States of America; United States Army.
U. S. M. United States mail; United States Marines.
U. S. N. United States Navy.
U. S. S. United States Senate; United States ship.
Ut. Utah.
Va. Virginia.
viz. videlicet, to wit, namely.
vs. Versus, against; versiculo, in such a verse.
Vt. Vermont.
Wash. Washington.
W. C. T. U. Women's Christian Temperance Union.
Wis. Wisconsin.
W. Va. West Virginia.
Wy. Wyoming.
Xmas. Christmas.
Y. M. C. A. Young Men's Christian Association.
Y. P. S. C. E. Young People's Society of Christian Endeavor.
Y. W. C. A. Young Women's Christian Association.

ABDICA'TION, properly the voluntary, but sometimes also the involuntary, resignation of an office, especially that of a sovereign. The more important abdications since the eighteenth century are the following:

Charles Emmanuel IV of Sardinia	June 4, 1802.
Charles IV of Spain	March 19, 1808.
Joseph Bonaparte of Naples	June 6, 1808.
Gustavus IV of Sweden	March 29, 1809.
Louis Bonaparte of Holland	July 2, 1810.
Napoleon of France	April 14, 1814. / June 22, 1815.
Victor Emmanuel of Sardinia	March 13, 1821.
Charles X of France	August 2, 1830.
William I of Holland	October 7, 1840.
Louis Philippe of France	February 24, 1848.
Ferdinand of Austria	December 2, 1848.
Charles Albert of Sardinia	March 23, 1849.
Isabella II of Spain	June 25, 1870.
Amadeus I of Spain	February 11, 1873.
Abd-ul-Aziz of Turkey	May 30, 1876.
Abd-ul-Hamid II of Turkey	April 27, 1909.
Nicholas II of Russia	March 15, 1917.
Constantine I of Greece	June 12, 1917.
Ferdinand I of Bulgaria	October 3, 1918.
Charles I of Austria	November 12, 1918.
William II of Germany	November 28, 1918.

The English law, that the king cannot abdicate without the consent of Parliament, differs from that of most countries.

ABDO'MEN, in man, the lower cavity of the trunk, separated from the upper cavity, or thorax, by the diaphragm and bounded below by the bones of the pelvis. It contains the intestines, liver, stomach, spleen, pancreas, kidneys and other organs. A serous



THORAX AND ABDOMEN

1, 1, 1, 1. Muscles of the chest. 2, 2, 2, 2. Ribs. 3, 3, 3. Upper, middle and lower lobes of the right lung. 4, 4. Lobes of the left lung. 5. Right ventricle of the heart. 6. Left ventricle. 7. Right auricle. 8. Left auricle. 9. Pulmonary artery. 10. Aorta. 11. Desending vena cava. 12. Trachea. 13. Oesophagus. 14, 14, 14, 14. Pleura. 15, 15. Diaphragm. 16, 16. Right and left lobes of the liver. 17. Gall cyst. 18. Stomach. 19. Duodenum. 20. Ascending colon. 21. Transverse colon. 22. Descending colon. 23, 23. Small intestine. 24. Thoracic duct opening into the left subclavian vein. 25. Spleen.

membrane, called the *peritoneum*, lines the cavity and is reflected from it in such a way as to enclose the contents, giving them the necessary freedom of movement and at the same time keeping them in their proper position. This membrane is the seat of the disease peritonitis. The chief organs of the abdomen and chest are shown in the illustration.

ABD-UL-HAMID II, *ahbd ul ha mēed'*, (1842–1918), thirty-fourth sultan of the Ottoman Empire, son of Abd-ul-Medjid, succeeded to the throne on the deposition of his brother, Murad V. The country at his accession was in a disturbed condition, to which the declaration of war by Russia in 1877 came as a climax. The Turks were de-

feated, and the Empire might have been completely overthrown, had not the European powers, fearing that Russia would grow too powerful, interfered in the peace negotiations. Turkey did, however, lose all claim to Bosnia, Bulgaria, Herzegovina, Montenegro, Rumania and Serbia. The sultan was also obliged to promise a reform in his treatment of his Christian subjects, but these promises he never fulfilled. However, by constantly playing the European nations against one another, he succeeded in warding off their interference. In 1908 he was compelled by the Young Turks to grant a constitution, and in April, 1909, he was deposed. See YOUNG TURKS.

ABECK'ET, THOMAS. See BECKET, THOMAS À.

A'BEL, the name of the second son of Adam and Eve (*Gen.* IV, 2). Abel was a shepherd and, according to the biblical story, offered his sacrifices in such a spirit that they were regarded with greater favor by the Lord than were Cain's. The latter, enraged at this, slew his brother.

ABELARD, *ab'e lard*, PIERRE, (1079–1142), an illustrious French scholastic philosopher and theologian. He went to Paris at the age of twenty, where he established himself as a philosophical lecturer in 1113. Later he obtained the chair held by his former master. At this moment his reputation was greatest. From Rome, England and Germany, students hastened to listen to his eloquent logic, and he numbered among his followers the ablest men of his time. He secretly married Heloïse, the beautiful niece of Fulbert, canon of Notre Dame, who in revenge put an end to their union. A council held at Soissons in 1121 condemned Abelard's opinions on the Trinity as heretical, and soon after he withdrew to Nogent-on-the-Seine, where he built an oratory, and named it the Paraclete, or Comforter. In 1140 the Pope condemned him, as a heretic, to perpetual silence.

ABERCROMBIE, *ab er crum'by*, JAMES (1706–1781), a British soldier who commanded the British forces in America during the French and Indian War. He was defeated at Ticonderoga in 1758, and was therefore superseded the next year. After his return to England he was elected to Parliament.

ABERDEEN, JOHN CAMPBELL GORDON, Seventh Earl of (1847–), a British statesman. Originally a member of the conservative party, in 1876 he joined the liberal party and cast his lot with Gladstone, who, in 1886, appointed him lord lieutenant of Ireland. From 1893 to 1898 governor general of Canada, in 1905 he was again appointed lord lieutenant of Ireland, and retained this position until 1915.

ABERDEEN', SCOTLAND, a royal burgh, capital of Aberdeenshire and the fourth largest Scottish city. The city is beautifully laid out and has streets which are regular and well-paved. It contains many notable buildings, chief among which are the municipal and county buildings, the Music Hall buildings, the Trades' Hall, the Roman Catholic church, Cathedral of Saint Machar and a university. The university was established in 1860 by the union and incorporation of the University and King's College of Aberdeen and the Marischal College and University of Aberdeen. Its library contains 140,000 volumes. There are also numerous other colleges and schools, among which are Robert Gordon's College, an art school and the Mechanics' Institute. Aberdeen has an excellent harbor, which facilitates trade and is responsible for the extensive commerce. The chief industrial establishments include woolen, cotton, jute and linen factories, soap, candle, chemical and paper works, shipbuilding yards and granite works. Population, 1911, 163,891; 1915, estimated, 178,574.

ABERDEEN', S. D., the second city in size in the state (Sioux Falls being larger), founded in 1880, incorporated in 1882, and one of the first of American cities to adopt the commission form of government. It is the county seat of Brown County. It is 125 miles northeast of Pierre, the capital, and 290 miles west of Saint Paul. The city is a commercial center; artesian wells furnish power for manufacture. There is a state normal school in Aberdeen. Four railroads—the Chicago & North Western, the Chicago, Milwaukee & Saint Paul, the Great Northern and the Minneapolis and Saint Louis, serve the city. Population, 1910, 10,753; in 1917, 15,926 (Federal estimate).

ABERDEEN, WASH., founded in 1889 and now the fourth city in the state, but rapidly gaining on the third (which is Yakima). It is 150 miles southwest of Seattle, and fifty miles west of Olympia. The city is on Gray's Harbor, sixteen miles from the

Pacific Ocean, and is known for its lumbering industries. Transportation is provided by the Northern Pacific and Chicago, Milwaukee & Saint Paul railroads and by the Oregon-Washington Railway & Navigation Company.

Large government expenditures on Gray's Harbor have greatly benefited the city. More lumber is shipped from here than from any other city in the world, it is claimed. It took front rank as a shipbuilding center in 1917. Population, 1910, 13,660; in 1917, 21,392 (Federal estimate).

ABERRA'TION, in physics, the term used to indicate the failure of rays of light to meet at a common focus when refracted by a lens or reflected by a mirror. When parallel rays of light pass through a double convex lens (see LENS), those near the edge are brought to a focus sooner than those passing through near the center. This causes the formation of an indistinct image. In optical instruments, such as the camera and telescope, this defect is remedied by the use of a diaphragm, which shuts off the edge. The diaphragm increases the distinctness of the outline of the image but decreases its brilliancy.

A large concave mirror acts in a similar manner, and the image cast upon a screen held in front of a mirror can be made more distinct by the use of a diaphragm. When the light is strong, this unequal refraction often separates the rays of light into their prismatic colors, so that we see a border of rainbow colors around the image. This is known as *chromatic* aberration. In telescopes and microscopes chromatic aberration is overcome by making the object glass of two pieces, one being of one kind of glass and the other of another.

In astronomy, the difference between the true and the observed position of a heavenly body is called aberration.

AB'IGAIL, a Biblical character, the beautiful wife of Nabal, a rich man of Carmel (*I Sam.* XXV). Afterward she became the wife of David. From her speech to David (See *I Sam.* XXV, 24-31), her name has been used as a general term for a lady's maid. When so used it is frequently written as a common noun.

ABILENE, *ab i leen'*, TEX., the county seat of Taylor County, 160 miles nearly west of Fort Worth, with extensive cotton industries. It is on the Texas & Pacific, the Abilene Southern and Wichita Valley railroads. The city is governed on the commission plan. Population, 1910, 9,204; in 1917, 14,954 (Federal estimate).

ABOLITIONISTS, *ab o lish'un ists*, a party which became influential during the first half of the nineteenth century in America, in favor of the immediate abolition of slavery. Its importance practically dates from the beginning of the work of William Lloyd Garrison in 1829 and the formation of the American Anti-slavery Society in 1833. The party divided soon after this time, however, Garrison and his followers advocating abolition even at the cost of disunion, while the more moderate party wished abolition through constitutional forms. They formed the Liberty party and later the Free-Soilers, and finally, in 1856, joined the Republican party. Among the prominent leaders of the radical Abolitionists were Wendell Phillips and John G. Whittier. See POLITICAL PARTIES IN THE UNITED STATES.

ABOMEY, *ah bo may'*, capital, until recently, of the kingdom of Dahomey, in West Africa, near the coast of Guinea. The town is surrounded by a mud wall and a trench which enclose a large tract of land, most of which is under cultivation. An important trade in ivory, gold and palm oil is carried on. Population, about 11,000. See DAHOMEY.

ABOUKIR, or **ABUKIR**, *ah'boo keer*, a small village on the Egyptian coast, thirteen miles northeast of Alexandria. In Aboukir Bay, in 1798, took place the naval Battle of the Nile, in which Nelson annihilated a French fleet and destroyed the naval power of France in the Mediterranean. Near this place, also, in 1799 Napoleon defeated the Turks under Mustapha.

A'BRAHAM, the greatest of the Hebrew patriarchs and founder of the Hebrew race. His name was originally Abram (meaning *exalted father*), but according to the account in the book of *Genesis* this was changed to Abraham (*father of a multitude*), because of the covenant between him and Jehovah that he should be the father of many nations. Abraham was born in Ur of the Chaldees, but later settled in Canaan. His two sons, Isaac (*Gen.* XVIII-XXXV) and Ishmael (*Gen.* XVI, XXI), figure prominently in Hebrew history as the representatives of the Israelites and the Arabs, respectively. Abraham died at the age of 175, and was buried beside his wife, Sarah,

in the cave of Machpelah. See BIBLE, subhead *Bible Stories.*

ABRA'SIVES, natural and artificial materials used for cutting and polishing wood, metals and stone. The most common natural abrasives are corundum, emery, sand, garnets and the varieties of rocks used for grindstones and whetstones. Other natural abrasives used to some extent are pumice, Tripoh and infusorial earth. The artificial abrasives are carborundum, crushed iron, steel and rouge. Crushed steel and steel emery are made by heating a good grade of steel to a high temperature and cooling it quickly in water, then reducing the cold steel to a powder by means of crushing machines or heavy hammers. This is then mixed with glue and applied to belts and wheels in the same manner as are emery and sand. The coarse grades of abrasives are used for cutting or rolling the material, and the finer grades for polishing. See CARBORUNDUM; EMERY; SAND BLAST.

ABRUZZI, *ah broot'see,* PRINCE LUIGI AMADEO, Duke of the (1873–), mountain-climber and Arctic explorer, first cousin to Victor Emmanuel III, king of Italy. He was the first (1897) to ascend Mount Saint Elias, and in 1900 he gained fame by his attempt to reach the North Pole. Though unsuccessful, he attained 86°39′ N. latitude, the highest latitude reached up to that time. In 1903 he ascended the peaks of Mount Ruwenzori, in equatorial Africa, and in 1906 led a mountain-climbing expedition to the Himalayas. The records of these explorations he has published in several books. His proposed marriage with the daughter of United States Senator Elkins of West Virginia in 1912 was opposed by the king. The Duke took command of the Italian fleet in 1915, when Italy entered the World War.

AB'SALOM, the third son of David, king of Israel. The account of his rebellion and death, and David's touching lamentation for his son, are to be found in *II Samuel.* A poetic version of the story is given in Nathaniel P. Willis's *The Death of Absalom.*

ABSCESS, *ab'ses,* a pus-filled cavity in a body tissue, caused by injury or by disease. Inflammation in the diseased area first causes an overcharge of blood in the capillaries; next, the blood flow decreases, and white blood corpuscles and serum seep through the walls of the capillaries. Both the white corpuscles and the serum attack the invading bacteria, and the product of this struggle is the pus. As the surrounding tissues are gradually dissolved, a pus-filled cavity is formed. Treatment usually consists in bringing the abscess to a head, then breaking it and draining the cavity of pus. As blood poisoning may result from neglect of an abscess, it is advisable to seek the advice of a physician when one forms.

AB'SINTH, or **AB'SINTHE,** an emerald green liquor consisting of an alcoholic solution strongly flavored with an extract of several sorts of wormwood, oil of anise and other substances. Absinth at first produces exhilaration, but its continued use leads to derangement of the digestive organs and the nervous system. French soldiers introduced the absinth habit into France after the Algerian War of 1844, and the liquor gained such a hold in that country that the government absolutely prohibited its use in 1915. Previously its use had been barred in the army and navy.

ABSOLU'TION, remission of a penitent's sins in the name of God. The passages of Scripture on which the Roman Catholic Church founds its doctrine of absolution are such as *Matthew* XVI, 19; XVIII, 18; *John* XX, 23.

ABSOR'BENTS, in physiology, systems of minute vessels by which the nutritive elements of food and other matters are carried into the circulation of vertebrate animals. See LACTEALS; LYMPHATICS; SKIN.

ABSORP'TION is that property of certain organs of the body by which they take into themselves fluids of various kinds. The manner of absorption still remains a mystery so far as what the living cell itself can accomplish, independent of the physical and chemical laws. Two fluids of varying density will pass through a moist membrane and intermix; they will also pass through under pressure; they will mix when brought into direct contact with each other. In these different ways, much of the digested matter in the alimentary canal enters the blood. The current may be reversed when certain substances are taken into the stomach, as Epsom salts cause the flow of the water of the blood into the intestines.

In order to be absorbed, a substance must be in the liquid or gaseous state; the less dense the substance the more rapid the absorption. Nearly all the absorption of food occurs in the small intestine, though some

water, salt and sugar are taken up in the mouth, and the same materials, with peptones, are taken up in the stomach. The principal organs of absorption are the *lymphatics, lacteals, blood vessels* and *skin.* See DIGESTION; LACTEALS; LYMPHATICS.

ABSTRAC'TION, in psychology, that process by which we separate a single idea from numerous ideas in consciousness, and focus the attention upon it; as, when looking at an object, we focus the attention upon its color to the exclusion of other qualities. Abstraction first appears in a child when he notices the difference between objects. Abstraction is one of the important phases of attention, and in its highest form it constitutes one of the most advanced mental activities. In the adult mind abstraction leads to classification.

Related Articles. Consult the following titles for additional information:

Apperception — Concept
Attention — Synthesis

AB'STRACT OF TITLE. See TITLE.

ABU-BEKR, *ah'boo bek'r,* (570–634), the father-in-law and first successor of Mohammed. His right to the succession was unsuccessfully contested by Ali Mohammed's son-in-law, who later became the fourth caliph and started the schism which divided Mohammedans into two sects, Sunnites and Shiites. See MOHAMMEDANISM.

ABU'TILON, a plant belonging to the mallow family, popularly known as *velvet leaf.* It is a common weed in various parts of America, but its smooth, velvety leaves and yellow, bellshaped flowers are very attractive. The genus abutilon includes about seventy species, some of which are cultivated as border plants in gardens. They are known as flowering maples. The leaves usually have white edges or spots, and the flowers vary from red to white and yellow.

ABY'DOS, an ancient city of Asia Minor, situated on the Hellespont, opposite Sestos. Near this place Xerxes and his army crossed over to Europe on a bridge of boats. Ancient writers say that Leander swam nightly from Abydos to Sestos to see his beloved Hero, and it is also said that Lord Byron accomplished this feat in swimming. See HERO.

ABYDOS, (now Arabat-el-Madfun), a village of Upper Egypt, about six miles west of the Nile, famous as the site of two temples to Osiris, and as the burial place of the god. In 1818 in one of the temples was found a tablet containing a list of Egyptian kings before Rameses II. In the other was found in 1894 a tablet bearing the names of the predecessors of Seti I. Both tablets are now in the British Museum. See OSIRIS.

ABYSSINIA, *ab i sin' i a,* a country in Eastern Africa, cut off from the sea by narrow Italian, French and British protectorates, and one of the two independent countries on the continent, Liberia being the other. Abyssinia has the added distinction of possessing one of the oldest of the world's governments. It is the home of nearly 9,000,000 people, and it is about 432,000 square miles in area—greater in size than Germany and France combined.

Inhabitants and Language. The Abyssinians are descendants from the Hamites and the Arabians who immigrated from Asia, but there are also numerous tribes of various nationalities, especially those that have descended from the Abyssinians and the negroes to the south. In color the Abyssinians vary from dark brown to black. They are of medium stature and of a quiet, tractable nature. The language of the court and the ruling class is Amharic, and that of the common people, Agua. These are peculiar to Abyssinia, not being spoken in any other country. In general the people are in a semi-civilized or barbarous state and use the most primitive implements and methods in their various occupations. They practice polygamy. Education is in the hands of the clergy and is limited to the merest elements of the common branches; but the people are beginning to adopt the ways of civilized nations.

Surface and Drainage. The main part of the country is a plateau, having an average altitude of 8,000 feet. In the center is a great depression occupied by Lake Tsana, having an area of 12,000 square miles, and from which flows the Atbara. On the north are the Samen Mountains, whose average altitude is 10,000 feet. South of these is the Talba Wakha, with a somewhat lower altitude. The southern part of the country is

less mountainous and somewhat rolling.

These highlands are the source of a number of important rivers, among them the Atbara and Blue Nile. With the exception of the Blue Nile, none of the streams in this region is navigable.

Climate. Abyssinia is divided into three climatic areas. The first includes those portions having an altitude below 4,800 feet, which possess a tropical or semi-tropical climate. The second embraces regions extending from 4,800 to 9,000 feet, which have a temperate climate, the average temperature being from 80° to 48°, according to altitude. The third embraces those portions of the country having an altitude above 9,000 feet. Here the average temperature is from 50° to 45°. In the lowlands the rainy season is from December to May, and in the higher lands of the interior two rainy seasons prevail, the first from April to June and the second from July to October. Throughout the country the climate is healthful.

Mineral Resources. Ores of iron and silver and deposits of salt and coal are found in the mountains and on the plateau. Gold is found in the beds of the streams, and recent explorations indicate that there are rich veins in the mountains, but none of the mines has been worked to any extent.

Agriculture. Agriculture is the principal industry. The land is divided among families instead of among individuals, and possession holds only during occupancy. The methods of cultivation are primitive, but the soil is fertile and yields good returns. The vegetation of the lowlands is luxuriant, and tropical fruits, sugar cane, coffee, bananas, indigo, cotton and dates are cultivated. In the middle region are found cereals, oranges, lemons, olives and fruits of the temperate region, while in the third region grazing and cultivation of the more hardy cereals, such as wheat, oats and rye, are the chief occupation. There are no manufactures worthy of mention.

Commerce. The commerce is limited. The imports have been restricted to bare necessities, and the exports to those commodities that can be most easily transported. A railway now extends from the Fench port of Jibutal, on the Gulf of Aden, to Harar, the chief commercial center of the country, and will be continued to Addis Abeba, the capital. This road furnishes an important outlet for the products of the region through which it passes, and will be the means of increasing the commerce. The leading foreign nations in trade with Abyssinia are Great Britain and the United States. A coin is issued by the king and is known as the Maria Theresa dollar, but bars of salt and cartridges also are used for money.

Government and Religion. Abyssinia is one of the few absolute monarchies which has been untouched by the progress of political reform; in hundreds of years there has been little change in manner of control. The ruler is called *negus,* which means *king of kings.* The government is supposed to observe an ancient code of Roman laws, but the king and native princes set these aside at pleasure. Local administration is in the hands of petty princes and native chiefs, each of whom supports a band of retainers to defend his territory against hostile tribes. The prevailing religion is a rude form of Christianity, which dates back several centuries before Christ, but some of the natives are Mohammedans.

Control by the negus is not absolute, for the provincial governors are often strong enough to ignore the head of the state and to exercise their own will.

History. Abyssinia is one of the oldest nations in existence. It is supposed that it is the Cush of the Scriptures, and the people believe it to have been the home of the Queen of Sheba. The ruler claims his descent from Menelek, the son of this queen and King Solomon, but good authorities consider his claims somewhat fanciful. By the spread of Mohammedanism at the close of the sixth century the people were cut off from intercourse with other countries, and as a result they relapsed into partial barbarism. In the fourteenth century the country began to regain its power and flourished for about two hundred years, when its intercourse with foreign nations was again cut off, and it remained secluded until about the beginning of the nineteenth century. In 1868 the Abyssinians were brought into conflict with the British because of depredations upon British outposts. They were thoroughly defeated and the king committed suicide. Menelek II was made king in 1889 and proved a shrewd and able administrator. In the year of the succession of King Menelek to the throne, Italy attempted to secure a protectorate over Abyssinia by force of

arms. The Italians were defeated and compelled to leave Abyssinia independent. In 1908 Menelek appointed his grandson, Ledy Jeassu, his successor. He came to the throne in December, 1913, on the death of Menelek, but proved weak and unable to cope with intrigue. In 1916 it was announced that he had been deposed in favor of Princess Zeoditu, daughter of the late Menelek and aunt of the negus.

ACACIA, *a ka'sha*, a genus of plants consisting of trees or shrubs with compound pinnate leaves and small leaflets, growing in Africa, Arabia and the East Indies and other tropical and subtropical countries. The flowers are arranged in spikes or globular heads, and grow in the axils of the leaves near the ends of the branches. The fruit is a dry unjointed pod. Several of the species yield gum-arabic and other gums; some have puckery barks and pods that are used in tanning; an Indian species yields the valuable medicine called catechu. The *wattle tree* of Australia, from fifteen to thirty feet in height, is the most beautiful and useful of the species found there. Its bark contains a large percentage of tannin. Several species of acacia have been successfully introduced into America.

ACACIA

ACADEMY, *ak ad'e mi*, a name derived from that of a school which Plato taught in a grove near Athens, belonging to the Greek hero Academus. As generally used, the word now means a secondary school, corresponding to a high school, or a body of men engaged in any scholarly, scientific or artistic pursuit. The name also may refer to the building in which the work is carried on. The French Academy, established by Richelieu in 1635, is the most noted of all academic associations. As organized, it contained forty members, and its object was to control the French language and create a refined literary taste. The institution still exists very much as it was organized, and to be elected a member of it is one of the greatest honors which a literary person can receive. The first American academy was the American Philosophical Society, organized in 1744 in Philadelphia. The Royal Academy (of artists) is a famous British institution.

ACADIA, *a ka'di a* the name formerly given to Nova Scotia. In 1755 the Acadians were forcibly deported from their homes because they refused to take the oath of allegiance to the British government. This episode has been narrated in beautiful verse by Longfellow in the poem *Evangeline*. See Nova Scotia.

ACAN'THUS, a genus of tropical and subtropical plants, two species of which are characterized by large white flowers and deeply indented shining leaves. They are favorite ornamental plants in gardens. In architecture the name is given to a kind of foliage decoration, much employed in Roman and later times. The conventionalized form is the characteristic decoration of the capital in the Corinthian column. See Column.

ACANTHUS
Natural Leaf and Conventionalized Leaf

ACCENT, *ak'sent*, an emphasis placed on a certain syllable of a word by which it is made more prominent than the other syllables. In words which contain more than two syllables there may be more than one accent; one, always stronger than the others, is known as the primary accent, while the others are secondary, as in *syn'copa'tion*. The tendency at present in English is to favor throwing the accent back towards the beginning of the word as far as euphony permits, as *incom' parable*. Varying shades of meaning are given a sentence by means of special stress on one or more words. This is called sentence accent. See Orthography.

In music, accent is the stress placed on certain tones in a bar of music. It falls always in the first part of the bar; and in long measures, as in words of several syllables, there may be a primary accent and one or two slight, secondary accents.

AC'CIDENT INSURANCE. See INSURANCE.

ACCLIMATIZA'TION, *ak klyme a ti za' shun,* **or ACCLIMA'TION,** the process by which a plant or animal adapts itself to a climate which is not natural to it. If the new species establishes itself in the new climate, the process is called *naturalization.* Cultivated plants, such as cereals, the potato and common fruits, are the best examples of acclimatization. Although in most of these the process seems to have been perfected, yet certain limitations are always appearing; for instance, corn cannot be grown in the short, cool seasons of the northern temperate regions, while wheat does not thrive as well in the warmer climates. There are countless instances of partial acclimatization, where the plant may grow thriftily for a time but fail to mature fruit or to reach the same woody structure which it possesses in its natural home.

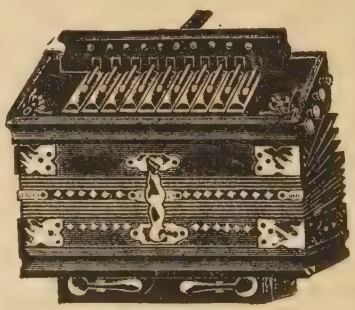
Animals vary considerably in their power to adapt themselves to different climates. Some, such as the dog, the cat, the domestic fowls and mice, have followed man into all parts of the world and seem to thrive wherever they locate. In general, it is true that any animal organism may adapt itself perfectly to certain conditions if they are presented slowly and by degrees, while if thrown suddenly among the same conditions it will die. Man himself possesses great adaptability, yet when changes are made suddenly, he may fall prey to fatal diseases. Whenever representatives of the races inhabiting the temperate climates are transported to the tropics, they find it difficult to preserve health and vigor for any great length of time. Modern sanitation and intelligent care, however, enable these people to live for many years in hot climates, preserve their health and even carry on the industries of their first home.

ACCOR'DION, a small wind instrument in the form of a box, from eight to twelve inches long and four inches wide. It contains a number of metallic reeds, which are set to vibrating by air forced into them by the folding bellows. The bellows is operated by the left hand, the right hand pressing a series of keys to regulate the pitch of the tones produced. See CONCERTINA.

ACCOUNTING, the methods by which the records of a business are analyzed. The purpose of bookkeeping is to show debts, both those due by a business and those due to a business (see BOOKKEEPING). The purpose of accounting is to show profits and losses.

The failure of a large corporation is almost always accompanied by a statement that the exact condition of the finances cannot be learned until experts have spent several days or weeks in examining the books. This apparent relation between success and accounting demands an explanation.

The average manufacturer does not know what things cost him. Not so many years ago business was conducted on a small scale. A manufacturer made only one commodity, or one line of commodities. A dealer bought a few goods which he distributed by comparatively simple methods. He paid rent, salaries and insurance and bought his stock; deducting these expenses from his total sales gave his net return. With the growing complexity of business, a single company manufactures or sells hundreds of commodities, many of which are by-products. If a firm makes a hundred products, ten of which are sold at a loss, the manager would be foolish not to drop the ten and increase profits on the other ninety. Some expenses may be for permanent improvements; these should not be charged as expenses for one year only, thus wiping out the profit for that year. The field of accounting is the analysis of a business into its operations, and the determination of the expense and profit from each operation. The principles of accounting are applied to every feature of business records. These features may be summarized in seven groups:



ACCORDION

1. Capital and revenue, their differences.

2. Depreciation, or wearing-out and consequent loss in value.
3. Balance sheets and their interpretation.
4. Cost accounting.
5. Special accounting, for railroads, etc.
6. Government accounting.
7. Auditing, or the examination of records.

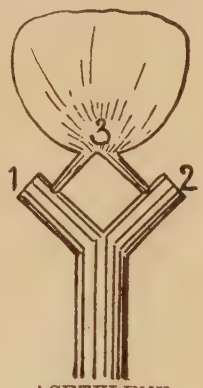
ACETANILID, *as et an'il id*, a white crystalline powder made by treating aniline with acetic acid. It is highly poisonous, but because of its action in allaying pain it is frequently given as a medicine. It is the active and often dangerous principle in many headache powders. Because of its effect upon the heart, acetanilid should never be taken except when prescribed by a reliable physician.

ACETATES, *as'e tayts*, salts of acetic acid. The acetates of most commercial or manufacturing importance are those of aluminum and iron, which are used in calico-printing; of copper, which, as verdigris, is used as a color; and of lead, best known as sugar of lead, and used in dyeing and in making a yellow pigment. Paris green is an acetate of copper and arsenic.

ACETIC, *a set'ic*, ACID, an acid produced by the oxidation of common alcohol and of many other organic substances. Pure acetic acid has a very sour taste and pungent smell, burns the skin and is poisonous. Pure strong acetic acid is called *glacial acetic acid* and at temperatures below 62° F. it is a solid. Vinegar is simply dilute acetic acid, and is prepared by exposing wine or weak spirits to the action of the air. It is also obtained from malt which has undergone fermentation. Acetic acid, both concentrated and dilute, is largely used in the arts, in medicine and for domestic purposes. See VINEGAR.

ACETYLENE, *a set' i leen*, a colorless gas formed by the union of hydrogen and carbon, used extensively for lighting purposes, especially in rural districts where electric light or ordinary illuminating gas cannot be obtained. In the air acetylene burns with a smoky flame, but when air mingles with the gas as the latter flows out of a small aperture, the flame is white, brilliant and smokeless. Acetylene is unique among chemical substances because of the immense amount of energy stored up in it. By reason of this energy (technically known as *endothermic energy*), it will give more heat when burned as a compound than could be obtained if the elements composing it were burned separately. The reverse is true of nearly all other chemicals.

Acetylene has not only high candle power and high heat-unit content, but a low kindling temperature. Because it ignites at a low temperature it is an excellent gas to use with lighters of the friction, electric or spark type, with which most of the modern miners' lamps are equipped. Acetylene burners used in house illumination give a light of about twenty candle power, and the cost is about three-fourths that of ordinary gas. When burned with oxygen, acetylene produces a temperature which chemists pronounce the highest possible by combustion of any fuel. This gas cannot, however, be used extensively for power purposes, because when stored under pressure exceeding fifteen or twenty pounds to the square inch it explodes.



ACETYLENE BURNER

Acetylene is produced by the action of water on calcium carbide. When the latter is put into contact with water the hydrogen in the water forms acetylene by uniting with the carbon of the calcium, one pound of calcium carbide yielding about 4.5 cubic feet of gas. Farmers often make the gas on their own premises by procuring reservoirs to hold the calcium carbide and the water, and an apparatus for mixing them. Besides its availability as an illuminant, acetylene is of value in metal welding and cutting. The flame can burn its way quickly through the hardest of metals.

ACHAEANS, *a kee'anz*, one of the four main divisions of the ancient Greeks. They migrated from Thessaly to the Peloponnesus, which they ruled in the prehistoric period. From very early times a confederacy existed among the twelve towns of this region. After the death of Alexander the Great it was broken up, but was revived again in 280 B. C., and from this time grew in power till it spread over the whole Peloponnesus. It was finally dissolved by the Romans in 146 B. C., and after this the whole of Greece, except Thessaly, was called Achaea and made a Roman province.

ACHATES, *a ka'teez,* a companion of Aeneas in his wanderings after his flight from Troy. He is always distinguished in Vergil's *Aeneid* by the epithet *fidus* (faithful), and has become the type of a faithful friend and companion. See AENEAS; AENEID.

ACHILLES, *a kil' eez,* a Greek legendary hero, the chief character in the *Iliad.* He was the son of Peleus and of the nereid Thetis, and was instructed in eloquence and the arts of war by Phoenix, and in medicine by the centaur Chiron. In the early part of the Trojan War the Greeks relied greatly on the strength and prowess of this hero, but after a time he deserted their cause because Agamemnon took from him Briseis, a captive maiden who had fallen to his share. "Unnumbered woes," wrote Homer, were laid on the Greeks by his "ruinous wrath." When his friend and kinsman, Patroclus, was killed, Achilles, incited by his fierce desire for revenge, became reconciled with Agamemnon, returned to the fight and killed Hector, the bravest of the Trojan warriors. Achilles, according to early legends, had been dipped by his mother in the Styx, and thus made invulnerable except for one heel, by which she had held him. It was in his heel that he received the wound which killed him.

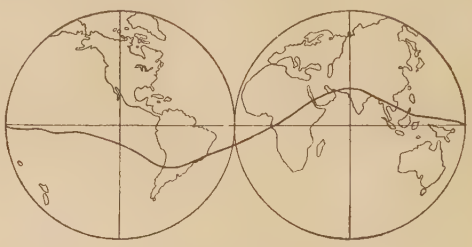
Tendon of Achilles, the strong tendon which connects the muscles of the calf with the heel. It may be easily felt just above the heel. The name refers to the story related above.

ACID, *as'id,* a name popularly applied to a number of compounds, solid, liquid and gaseous, having more or less the qualities of vinegar. The general properties assigned to them are a tart, sour taste, the power of changing vegetable blues into reds and of being in various degrees neutralized by alkalies. An acid has been defined as a substance containing hydrogen, this hydrogen being in whole or in part replaceable by a metal in the form of a base. It is *monobasic, dibasic* or *tribasic,* according to the number of hydrogen atoms replaced. When hydrogen is replaced by a metal, the result is called the *salt* of that metal. Sulphuric acid, nitric acid and hydrochloric acid are manufactured on an extensive scale, and are very useful products. There are many useful acids which occur in nature, and a great many more that are prepared artificially.

Related Articles. Consult the following titles for additional information:

Acetic Acid	Hydrochloric Acid
Carbolic Acid	Lactic Acid
Citric Acid	Nitric Acid
Formic Acid	Sulphuric Acid

ACLIN'IC LINE, the magnetic equator, an irregular curve in the neighborhood of



ACLINIC LINE

the terrestial equator, on which the magnetic needle balances itself horizontally, having no dip. See DIPPING NEEDLE.

ACONCAGUA, *ah'kon kah'gwah,* an extinct volcano in the Argentine Republic, in the southern part of the Andes. It is usually considered the highest mountain in America, its height being estimated at 23,000 feet. It was first ascended in 1897 by Zurbriggen. A river of the same name, 200 miles in length, rises on the southern slope of the mountain and enters the Pacific.

ACONITE, *ak' o nite,* a genus of hardy herbs represented by the well-known *wolf's-bane* or *monk's-hood,* and remarkable for their poisonous properties and medicinal qualities. Aconite acts upon the heart to lessen its action, and in fatal doses it kills by paralyzing the heart.

ACOUSTICS, *a kow'stiks* or *a koo'stiks,* that property of an audience room which determines how easily sounds produced in it may be heard. A room is said to have good acoustic properties when listeners in all parts of it can hear distinctly the words of a speaker. Walls that reflect sound waves in such a way that the speaker's words are run together give a hall poor acoustics. For an explanation of sound production, see SOUND.

ACRE, *a'kur,* a standard measure of land, used in the United States and England. Originally the name seems to have meant the amount of land which one man could plow in a day. The acre consists of 160 square rods. It is approximately equal to .404 hectares. To measure off an acre of land, mark off a square, each side of which is 160 rods in length.

ACROP'OLIS, the citadel or chief place of a Grecian city, usually on an eminence commanding the town. That of Athens, the best example, contained some of the finest buildings in the world. See PARTHENON; ERECHTHEUM; TEMPLE OF NIKE APTEROS; PROPYLAEA; THESEUM.

ACROSTIC, *a kros'tik*, a poem of which the first or last, or certain other letters of the lines, taken in order, form some word, name, motto or sentence, as in the following:

Truth as refined as ever Athens heard,
that wakes to perish never;
Hope like the gleaming taper's steady
light,
Incite our hearts to noblest thought and
word and deed and best endeavor;
Numberless blessings truth and hope
impart, sweet melodies inspiring;
Kindling the soul with zeal to do the
right, in virtues never tiring.

A poem of which both first and last letters are thus arranged is called a *double acrostic*. Acrostics have been much used in complimentary verses, the initial letters giving the name of the person eulogized.

In Hebrew poetry, the term was applied to a poem of which the initial letters of the lines or stanzas gave the names of letters of the alphabet in their order, as in *Psalm* CXIX.

ACTAEON, *ak tee'on*, in Greek mythology, a great hunter who was turned into a stag and was torn to pieces by his own dogs, as a

ACTAEON AND HIS DOGS
From a statue in the British Museum

punishment for looking on Artemis when she was bathing. In another version of the story Actaeon was thus punished because he had boasted that he was superior to Artemis in hunting.

AC'TINISM, the chemical action caused by light. When sunlight is resolved into its spectrum (see LIGHT, subhead *Spectrum*), it is found that the different rays possess the power of producing chemical changes in a varying degree. The most rapid changes occur in the violet rays and the dark space just beyond, while the red rays have little power to cause chemical action. The varying chemical power of the different rays can be shown by directing a spectrum on to a sheet of white paper moistened with a solution of nitrate of silver. The shading will decrease in intensity from the portion on which the violet rays fall to beyond the red rays, where little or no change can be detected. Practical applications of this property of light are made in the arts. Photographers use a red light in the developing room, since its rays will not affect the undeveloped negatives. Horticulturists sometimes use blue or violet glass for covering hot-houses or hot-beds in which they wish plants to grow rapidly. The blue and purple rays are also used by physicians in treating certain diseases, and recent research has shown that the blue rays are very effective.

ACTIUM, *ak'shi um*, (now **AK'RI**), a promontory on the western coast of Northern Greece, memorable for the naval victory gained here by Octavianus (afterward the Emperor Augustus) over Antony and Cleopatra, 31 B. C. Cleopatra fled with sixty Egyptian ships, and Antony followed her to Egypt. His deserted fleet was overcome after a brave resistance. This battle marked the accession of Octavianus to the supreme power in Rome.

ACTS OF THE APOSTLES, one of the books of the New Testament, written in Greek, probably in A. D. 63 or 64, and usually attributed to Saint Luke. It embraces a period of about thirty years, beginning immediately after the Resurrection and extending to the second year of the imprisonment of Saint Paul in Rome.

ADAM AND EVE, the names given in Scripture to our first parents. An account of them and their immediate descendants is given in the early chapters of *Genesis*. The story of their temptation and fall from grace in the Garden of Eden is regarded as symbolical of the entrance of sin into the world.

ADAMS, Charles Francis (1807–1886), an American statesman, son of John Quincy Adams. His early years were spent in Europe, but he was graduated at Harvard, and afterward studied law in the office of Daniel Webster. After serving for several years in the Massachusetts legislature, he was elected to Congress in 1858. In 1861 he was sent to England as American minister, and for seven years he performed the arduous duties of his office with tact and ability. He was one of the arbitrators of the *Alabama* claims. He edited the *Memoirs of John Quincy Adams.*

ADAMS, Charles Francis, Jr. (1835–1915), an American historian and statesman, born in Boston. He was graduated at Harvard in 1856 and was admitted to the bar in 1858. Adams served in the Union army and was made brigadier-general at the close of the war. In 1869 he was appointed to the board of railroad commissioners for Massachusetts, and in 1884 he became president of the Union Pacific railway, a position which he filled for six years. He published *Chapters of Erie; Notes on Railway Accidents;* and *Massachusetts: Its Historians and Its History,* besides other work of a miscellaneous character.

ADAMS, Charles Kendall (1835–1902), an American educator and historian, born at Derby, Vt. He was educated in the University of Michigan and in universities in Germany, France and Italy. In 1885 he was elected president of Cornell University, where he served for seventeen years. He resigned this position and in 1893 was chosen president of the University of Wisconsin, remaining there until a short time before his death. Doctor Adams was the founder of the seminary of history in the University of Michigan, and he introduced the seminary method of studying history into the United States. He is the author of a number of works, the most important being *Democracy and Monarchy in France, A Manual of Historical Literature* and *Christopher Columbus, His Life and Work.* He was also editor-in-chief of *Johnson's Universal Cyclopedia.*

ADAMS, Henry (1831–), son of the above, is a notable American historian, a native of Boston and a graduate of Harvard University. His works, based on original research, include *Anglo-Saxon Courts of Law* and *History of the United States to 1817.*

Residence at Quincy

ADAMS, John (1735–1826), second President of the United States, and the most famous member of a family of distinguished statesmen. He was born at Quincy, Mass., and educated at Harvard College. After completing a course in law he was admitted to the bar (1758). Adams' attention was directed to politics by the question as to the right of the English Parliament to tax the colonies, and in 1765 he published some essays strongly opposed to the claims of the mother country. As a member of the Continental Congress he was strenuous in his opposition to the home government, and in organizing the various departments of the colonial government. On May 13th, 1776, he seconded the motion for a declaration of independence proposed by Lee of Virginia, and was appointed a member of the committee to draw it up. The declaration was actually drawn up by Jefferson, but it was Adams who carried it through Congress.

In 1778 he went to France on a special mission, and after a brief home visit returned to Europe. For nine years he resided abroad as representative of his country in France, Holland and England. After taking part in the peace negotiations he was appointed, in 1785, the first ambassador of the United States to the court of Saint James.

He was recalled in 1788, and in the same year was elected Vice-President of the republic, under Washington. In 1792 he was re-elected Vice-President, and at the following election was chosen President. Though a member of the Federalist party, which favored a strong central government, Adams was frequently at variance with Hamilton, the real leader of that party, and his administration was stormy. He had to face not only dissensions in his own party, but the bitter hostility of Jeffer-

JOHN ADAMS

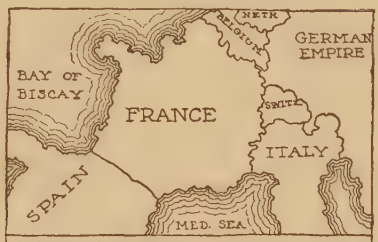
ADAMS' ADMINISTRATION
1797–1801

ALIEN LAW
THE PRESIDENT COULD EXPEL FROM THE COUNTRY ANY FOREIGNER WHOM HE DEEMED INJURIOUS TO THE UNITED STATES . . . .

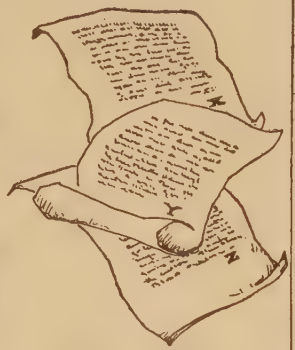
SEDITION LAW
ANYONE LIBELING CONGRESS OR THE GOVERNMENT COULD BE FINED OR IMPRISONED . . . .

KENTUCKY AND VIRGINIA RESOLUTIONS
DECLARED THE ALIEN AND SEDITION LAWS UNCONSTITUTIONAL · ASSERTED THE DOCTRINE OF STATES RIGHTS . . .

JOHN MARSHALL, CHIEF JUSTICE



MILLIONS FOR DEFENSE, BUT NOT ONE CENT FOR TRIBUTE



X-Y-Z PAPERS

WASHINGTON DIED 1799

"FIRST IN WAR, FIRST IN PEACE, FIRST IN THE HEARTS OF HIS COUNTRYMEN"

CAPITOL, 1790-1800

CONGRESS HALL, PHILADELPHIA

CAPTURE OF FRENCH SHIP, "LA VENGEANCE"

Administration of John Adams, 1797-1801

I. The President
- (1) Ancestry
- (2) Birth
- (3) Education
- (4) Early career
- (5) Political principles
- (6) Character
- (7) Death

II. Government Affairs
- (1) Foreign
  - (a) Difficulties with France
    - (1) Pinckney insulted
    - (2) X. Y. Z. mission
    - (3) Second mission
    - (4) War with France
      - (a) Growth of the navy
      - (b) Capture of "La Vengeance"
      - (c) Prizes
      - (d) Washington, commander-in-chief
    - (5) France retracts
  - (b) Relations with Haiti
    - (1) Promises support to Toussaint
    - (2) Overthrow of Toussaint
- (2) Domestic
  - (a) Alien and Sedition Laws
    - (1) Naturalization Act
      - (a) Lengthened term of years
      - (b) Object
    - (2) Alien Act
      - (a) To exclude dangerous aliens
      - (b) In effect for two years
    - (3) Sedition Act
      - (a) To punish libel and slander
      - (b) Popular excitement
    - (4) Virginia and Kentucky resolutions
      - (a) Declared the laws unconstitutional
      - (b) Asserted doctrine of states' rights
  - (b) Eleventh Amendment
    - (1) In force, 1798
    - (2) States cannot be sued by individuals
  - (c) John Marshall, Chief Justice
  - (d) Removal of the capital to Washington

III. Internal Affairs
- (1) Death of Washington
- (2) "Hail, Columbia" written, 1798

IV. Election of 1800
- (1) Parties
  - (a) Federal
  - (b) Republican
- (2) Candidates
  - (a) Jefferson
  - (b) Burr
  - (c) Adams
  - (d) Pinckney
- (3) Election by house
- (4) Downfall of the Federalists

Questions

When was John Adams born?

At what college did he study?

What profession did he adopt?

In general, what was the character of his administration?

What was the X. Y. Z. mission?

Who were the commissioners?

What did they accomplish?

What famous sea-fight took place during this quarrel with France?

Who was Toussaint?

What did he try to accomplish?

Why did he fail?

What was the general purpose of the Alien and Sedition laws?

What were the terms of the Alien Act? Of the Sedition Act?

How long were they to be in force?

What effect did they have?

What were the Kentucky and Virginia Resolutions?

When did Marshall become Chief Justice?

What are some of the famous cases he helped to decide?

When did Washington become the seat of government?

son and his adherents. The Jeffersonians were in warm sympathy with the French Revolutionists, while the Federalists favored England. Adams, determined to keep the country at peace, and above all from extending aid to France, sent three commissioners in 1797 to treat with the French government, as the relations between the two nations were somewhat strained. The insulting proposal of Talleyrand, the French foreign minister, that the United States pay France tribute money, aroused bitter indignation in America, and quick preparations were made for war. A brief naval war did actually take place, in which the French frigate *La Vengeance* was sunk by the *Constellation*. The prospect of America allied with England soon brought France to terms, and the difficulties were peacefully adjusted.

Adams, however, dug his political grave by his advocacy of the Alien and Sedition Laws, which were directed at the opponents of the administration. These laws were denounced as violations of the right of free speech and the freedom of the press, and their passage caused the downfall of the Federalist party. Adams failed of reëlection, but before he retired from office he made one of the most important appointments in American history—that of John Marshall to the chief justiceship of the Supreme Court. Other events of his administration were the death of Washington and the formal removal of the government offices to Washington (1800), then set in the midst of a forest and exceedingly rough and unattractive in its primitiveness.

At the close of his term of office Adams retired to private life, disappointed and embittered at his failure to secure reëlection. However, the subsequent election of his son, John Quincy Adams, to the Presidency was a consoling incident of his last days. He died on July 4, 1826, the fiftieth anniversary of the Declaration of Independence, only a few hours after Thomas Jefferson passed away. The death of two such illustrious men on the same day has no parallel in the political history of America or of any other country. Adams' last words were, "Thomas Jefferson still survives." He did not know of the sad event in Virginia.

Related Articles. Consult the following titles for additional information:

Alien and Sedition Laws
Marshall, John
Political Parties in the United States
X Y Z Correspondence

Birthplace at Quincy

ADAMS, JOHN QUINCY (1767–1848), sixth President of the United States, son of John Adams, the second President. He is the only President who served in Congress after the close of his administration. Adams was born at Quincy, Mass., accompanied his father to Europe and was educated there in part, but was graduated at Harvard College in 1788. He was admitted to the bar in 1791, and soon began to take an active interest in politics. His published letters on public issues having attracted general attention, in 1794 he was appointed by Washington as minister to The Hague. He afterward was sent to Portugal, and by his father as minister to Berlin. Adams entered the state senate and was elected by the Federalists to the United States Senate from Massachusetts in 1803. During this period he often voted with the Jeffersonians, and thus incurred the displeasure of his constitutents to such an extent that he resigned.

In 1809 Adams was appointed minister to Russia by President Madison, and he held that position until 1814. As his next public service he assisted in negotiating the peace of 1814 with England, and was afterward appointed resident minister at London. Under Monroe he was Secretary of State, and in that capacity had much to do with framing the famous Monroe Doctrine.

At the expiration of Monroe's double term of office Adams succeeded to the Presidency (1825) as the candidate of the so-called National-Republicans, those Republicans who favored protection and internal improvements. An important event of his administration was the passage of a protective tariff law in 1828, known as the "Tariff of Abominations." During his term the Erie Canal was completed, Bunker Hill Monument was begun, and the first railroad in the United

JOHN QUINCY ADAMS

Administration of John Quincy Adams, 1825-1829

I. The President
- (1) Ancestry
- (2) Birth
- (3) Youth and education
- (4) Early career
- (5) Character
- (6) Later career
- (7) Death

II. Governmental Affairs
- (1) Clay as Secretary of State
  - (a) Charges of corrupt bargain
  - (b) A cause of party feeling
- (2) New political parties
  - (a) "Adams men" or "National Republicans"
    - (1) Led by Adams and Clay
    - (2) Advocated broad and liberal policy
  - (b) "Jackson men"
    - (1) Led by Jackson and Calhoun
    - (2) Strict constructionists
  - (c) Anti-Masonic party
    - (1) Came into political prominence, 1831
- (3) Panama Congress
- (4) Georgia and the Indians
  - (a) Trouble between state and Federal government
  - (b) Trouble between state and Indians
- (5) Joint occupation of the Oregon country
- (6) Tariff of 1828, known as the Tariff of Abominations
  - (a) High protective tariff
    - (1) Favored by manufacturing interest of the North
    - (2) Opposed by agricultural South
      - (a) Retaliation urged
      - (b) Nullification proposed

III. Internal Improvements and Development
- (1) Canals
  - (a) Erie Canal opened, 1825
  - (b) Delaware and Chesapeake
  - (c) Chesapeake and Ohio
- (2) Railroads
  - (a) Aided by states or national government
  - (b) First railroads begun
- (3) Roads and turnpikes
  - (a) Cumberland Road or National Pike
  - (b) State roads
- (4) Industrial changes
  - (a) New trades and occupations
  - (b) Growth of the factory system
  - (c) Poverty in the cities
  - (d) Introduction of gas and anthracite
  - (e) Growth of the cotton trade

IV. Other Important Events
- (1) Death of Jefferson
- (2) Death of John Adams
- (3) First edition of Webster's Dictionary
- (4) Bunker Hill Monument erected

V. Election of 1828
- (1) Issues
- (2) Candidates
- (3) Significance of Jackson's election

Questions

When was John Quincy Adams born?

Who are some other famous members of his family?

Give a brief sketch of Adams' career before he became President?

What caused the charges of a "corrupt bargain" between Adams and Clay?

What broad division of parties now took place?

Who were the leaders of each party and what were the principles for which they stood?

What caused the trouble between Georgia and the Indians?

Why did the United States Government interfere?

What is meant by the "Tariff of Abominations"?

What were its purposes?

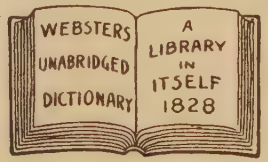
1825 "THE WALKING VOCABULARY" "THE OLD MAN ELOQUENT" 1829

J·Q·ADAMS' ADMINISTRATION

"THIS IS THE LAST OF EARTH" "TALENT, OPPORTUNITY, EFFORT, RESULTS."

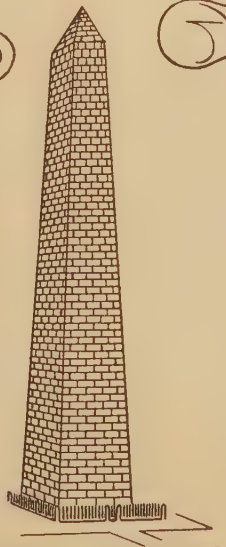
JEFFERSON
JULY 4, 1826.

ADAMS
JULY 4. 1826.



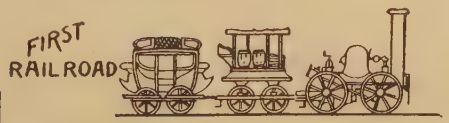
IMPORTANT EVENTS

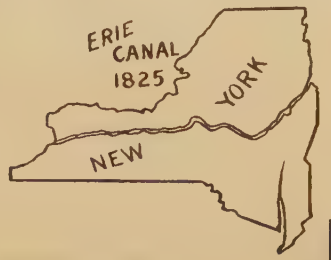
1825 - BUNKER HILL
ERIE CANAL OPENED
1826 - DEATH OF JOHN ADAMS
DEATH OF JEFFERSON
DISAPPEARANCE OF MORGAN
1827 - FIRST RAILWAY
1828 - BILL OF ABOMINATIONS
WEBSTERS DICTIONARY



NEW POLITICAL PARTIES

NATIONAL REPUBLICAN	ANTI MASONIC
I - TIME - 1825 - 35	I - TIME - 1827
II - PRINCIPLES: PUBLIC IMPROVEMENT, PROTECTIVE TARIFF, NATIONAL BANK	II - PLATFORM: SUPPRESSION OF MASONRY. OPPOSITION TO SECRET SOCIETIES
III - LEADERS: CLAY, ADAMS, WEBSTER	III - PRESIDENTIAL CANDIDATE - WILLIAM WIRT -
IV - PRESIDENT - ADAMS.	IV - INFLUENCE: CONTROLLED N.Y. ELECTIONS





States was opened (1826). This road extended from Quincy, Mass., Adams's old home, to Charlestown.

Adams was not able, as President, to satisfy any one of the numerous political factions, and was not reëlected. In 1830 he returned to the lower house of Congress and continued to represent his state with remarkable ability till his death, his efforts being chiefly in behalf of the abolitionist party. In the house his skill as a debater won him the name of "Old Man Eloquent," and he literally "died in the harness," suffering a stroke of paralysis while at his desk.

Related Articles. Consult the following titles for additional information:
Clay, Henry
Monroe Doctrine
Political Parties in the United States

ADAMS, Mass., in Berkshire County, in the midst of the Berkshire Hills. Greylock Mountain, elevation 3,505 feet, is partly within the city limits. The Boston & Albany Railroad serves the city, and it is also on the Hoosac River. The chief industries are cotton and paper manufactories. The town was established in 1749 as East Hoosick, and named in 1778 for Samuel Adams. Population, 1910, 13,026; in 1917, 14,406 (Federal estimate), in which several villages are included.

ADAMS, Maude Kiskadden (1872–), an American actress, born in Salt Lake City, Utah. In the companies of which her mother was a member, Maude Adams often appeared while a child, and at sixteen years of age she joined Sothern's company. Later, as a member of Frohman's stock company, her reputation grew steadily, and with her presentation of Lady Babbie in *The Little Minister*, a dramatization of Barrie's novel, she scored a great success. As Juliet, and as the Duc de Reichstadt in *L'Aiglon*, she gained great popularity, which has been increased by her productions of Barrie's *Quality Street, Peter Pan, What Every Woman Knows, The Legend of Leonara* and *A Kiss for Cinderella.*

ADAMS, Samuel (1722–1803), an American statesman, second cousin of John Adams, and one of the most zealous supporters of the Declaration of Independence. Throughout the period in which the colonists were opposing the mother country, Samuel Adams was known as an unflinching advocate of American independence. He had an important part in the framing of the state constitution of Massachusetts, and also used his influence in favor of the Federal Constitution and the first ten amendments. After the war he became lieutenant-governor of Massachusetts, and from 1794 to 1797 was governor of the state. In political matters Adams held views similar to those of Thomas Jefferson.

ADAMS, William Taylor (1822–1897), an American author of juvenile stories, better known by his pen name, Oliver Optic. He taught for twenty years in Boston, and was once a member of the Massachusetts state legislature. His works comprise over one hundred volumes, of which may be mentioned *The Young America Abroad Series, The Boat Club Series* and *The Starry Flag Series.*

ADAM'S APPLE. See Larynx.

ADDAMS, Jane (1860–), America's foremost social settlement worker, was born at Cedarville, Ill. She was graduated at Rockford College in 1881, and then spent two years in travel and study in Europe. After a year's study of social conditions in Philadelphia, Miss Addams went to Chicago, where she secured the coöperation of Miss Ellen Gates Starr in the establishment of Hull House, a social settlement in one of the city's poorest districts (see Hull House). Her energy and ability and her sane sympathy with the dwellers in the slums soon brought the settlement to prominence and made it the leading institution of its kind in the United States. She has made an intimate study of the problems of the slums, and is universally recognized as one of the foremost authorities on such social questions as tenements and child labor.

In addition to her work as head resident of Hull House, Miss Addams assumed many duties of a semi-public nature. She was for three years one of the city's inspectors of streets and alleys. In 1909 she was president of the National Conference of Charities and Correction. She is a leader in the movement to give suffrage rights to women, and in 1912 was a prominent delegate to the first national convention of the Progressive party, being the first woman to make a speech seconding the nomination of a candidate for the Presidency. Throughout the campaign of that year she was active in support of Mr. Roosevelt. Miss Addams has long been actively identified with the movement for universal peace. Though she is thoroughly in sympathy with the pacifist ideal, she lent her services to the United States food adminis-

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JANE ADDAMS

tration board after the nation entered the World War, and toured the country in the interest of food conservation.

Miss Addams has written a number of books on social and political reform, including *Democracy and Social Ethics, Newer Ideals of Peace,* and *The Spirit of Youth and the City Streets.* Another book, *Twenty Years at Hull House,* is the record of the great work for which she will always be best remembered. Her latest work is *A New Conscience and An Ancient Evil.*

AD'DAX, or **AD'DAS**, a species of antelope of northeastern Africa. The horns of the male are about four feet long, beautifully twisted into a wide sweeping spiral of two

ADDAX

turns and a half, with the points directed outward. The addax has tufts of hair on the forehead and throat, and large broad hoofs.

AD'DER, a name given to certain poisonous vipers, as well as to certain harmless snakes. In the United States the term is applied to the copperhead and to the water moccasin, but in general, when the name is used without qualification, the adder of Great Britain, the only poisonous snake in the islands, is referred to. The *puff adder* or *asp* is a snake of South Africa whose bite is always fatal. The name is derived from the serpent's power of puffing out the upper part of its neck when irritated or alarmed. It is very thick and attains a length of four or five feet. The natives poison their arrows with its venom.

ADDING MACHINE. See CALCULATING MACHINE.

ADDIS ABEBA, *ah'dis a ba'bah*, ABYSSINIA, the capital of the kingdom, is situated in the province of Shoa, at an altitude of over 8,000 feet. It has no regular streets and is cut into several sections by deep ravines. This city was the scene of the signing of the treaty of peace between Italy and Abyssinia in 1896, in which Italy resigned her claim to a protectorate and acknowledged the independence of Abyssinia. Population, estimated, 50,000.

AD'DISON, JOSEPH (1672–1719), an English poet and essayist, born at Milston, in Wiltshire. He studied at Oxford and won a name for himself by his easy, graceful Latin verse. After his graduation he was given a pension by the government, which enabled him to travel on the continent for several years. While in Italy he penned his poetical *Letter* to Lord Halifax. In 1704 he wrote *The Campaign,* a poem addressed to the duke Marlborough, celebrating his victory at the Battle of Blenheim, and this secured him several government appointments. He commenced to write for the *Tatler,* in 1709, and for its successor, the *Spectator,* in 1711. His tragedy of *Cato,* produced in 1713, met with great success. His marriage to the dowager Countess of Warwick occurred in 1716, but he gained little happiness from the union.

JOSEPH ADDISON

Of Addison's poetry one or two sacred pieces will endure as long as the language; but it is by his essays in the *Spectator* that he is best known. For humor and poetic grace, for elegance of style and for good-humored satire, these essays remain unsurpassed. Best known is the delightful series on *Sir Roger de Coverley,* with its excellent character-drawing. This series is regarded by critics as a step in the development of the novel.

ADDRESS, FORMS OF, in the United States are not so rigidly observed as in monarchical countries and are less formal and elaborate. The Constitution of the United States provides that no title shall be granted by the government, and that no official of the United States shall accept a title from any foreign

state. The President of the United States and the governor of Massachusetts possess by legislative act the title *Excellency,* and the same title is usually given by courtesy to governors of other states. In addressing the President or a governor in writing, or in speaking of him formally, the form used is, *His Excellency the President of the United States or His Excellency the Governor of.* .....

Several other important forms follow:

Vice-President of the United States: The Honorable the Vice-President of the United States, or The Honorable ....., Vice-President of the United States.

Cabinet officer: The Honorable the Secretary of State, etc.; The Honorable the Postmaster-general.

Supreme Court, Chief Justice: The Honorable ....., Chief Justice of the Supreme Court of the United States.

Associate justices of the Supreme Court, superior court justices, lieutenant-governors of states, mayors of cities and Senators and Representatives of the United States and of the several states are also addressed as The Honorable.

Archbishops: The Most Reverend ....., Archbishop of .....

Cardinals: His Eminence ....., Cardinal Archbishop of .....

Roman Catholic or Episcopal bishops: The Right Reverend.

Holders of professional degrees are usually addressed in writing by the abbreviation of their titles, such as Dr., Prof. and Rev. The article the should never be used with an abbreviation; The Reverend ..... is correct, but The Rev. ..... is incorrect.

The abbreviation *Esq.,* for *Esquire,* is frequently used in the United States and generally in Canada and Great Britain. When *Esq.* follows the name of a person the abbreviation *Mr.* is never used. In Great Britain the title *esquire* seems to have been confined at first to lawyers, country gentlemen with large estates and to the oldest sons of knights, but no particular significance is now attached to its use.

ADE, GEORGE (1866–), an American humorist, born at Kentland, Ind. He was educated at Purdue University and did newspaper work in Lafayette, Ind., and in Chicago, where he became known for his sketches of street-life. Among other books, he published a series of *Fables in Slang,* remarkable for their wit and knowledge of human failings. Of his other works, *The Sultan of Sulu, Peggy from Paris, The Shogun* and *The Fair Co-Ed* are light operas, marked by the same qualities of wit and insight into human nature; and he has exhibited the same characteristics in several popular comedies, including *The College Widow, The County Chairman, The Slim Princess* and *Knocking the Neighbors. Leave it to Jane,* a musical version of his *College Widow,* was successfully produced in 1918.

ADELAIDE, *ad'e layd,* SOUTH AUSTRALIA, the capital city of the state, is situated on the Torrens River, seven miles from the coast and 508 miles northwest of Melbourne. The Torrens has been enlarged by the damming of a lake in its vicinity, and is crossed by a number of beautiful bridges. The most important buildings are the Parliament buildings, costing nearly half a million dollars, the town hall, the South Australia Institute, a library and art galleries. The city also has a beautiful botanical garden and other parks. It is the see of a Catholic and an Anglican bishop and contains a large number of churches. The chief industrial plants are iron foundries, woolen mills, soap and starch factories, tanneries and breweries. Lead and copper are mined in the vicinity, and the city carries on a large trade. Adelaide was founded in 1836. Population, 1911, including suburbs, 189,646; 1916, 223,718.

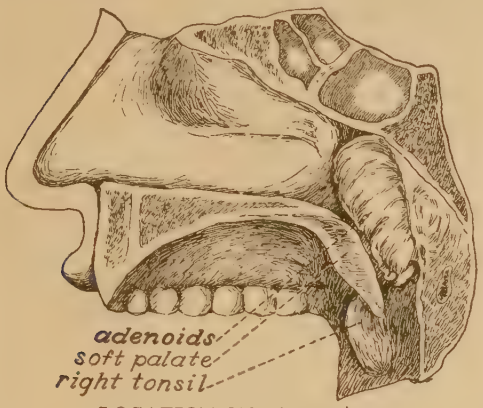
Port Adelaide, the port of the city, which is seven miles distant, has an excellent harbor and is the port of call for nearly all European vessels. Population, 3,386.

ADEN, *ah'den* or *a'den,* a seaport town and territory on the southwest coast of Arabia, belonging to Great Britain. Occupying an important military position, Aden is strongly fortified and permanently garrisoned; it has been called the Gibraltar of the East. The city is situated in the crater of an extinct volcano, and is surrounded by rocky peaks, which attain a height of from 1,000 to 1,775 feet. The harbor is deep and commodious, and Aden is one of the most important coaling stations on the route of vessels passing through the Suez Canal. Population, 1911, 46,165.

Gulf of Aden, an indentation of the Indian Ocean, on which the town of Aden is situated. It extends westward between Arabia and Africa to the Strait of Bab-el-Mandeb, and is about 550 miles in length.

ADENOIDS, *ad'e noydz,* the excessive growth of certain spongy tissues which lie between the back of the nose and the throat. These tissues lie in the passage through

which air, if inhaled through the nostrils, must pass before it reaches the lungs, and they also are close to the openings of the tubes passing from the throat to the ear.



LOCATION OF ADENOIDS

Enlargement of these tissues, occurring mostly in young children, prevents proper breathing and lung development and makes the child dull of hearing. Inflamed tonsils and "chronic colds" are likely to accompany adenoids. Children who breathe with their mouths open are liable to be found suffering from adenoids or from inflammation of the tonsils (see TONSILS). In recent years the operation of removing adenoids has been frequently performed with success.

ADHE'SION, the attraction which two substances made of different kinds of molecules have for each other when brought into close contact. It is by adhesion that chalk sticks to a blackboard, paint to wood, and the lead of a pencil to paper. Adhesion may also exist between two solids, between a solid and a fluid, or between two fluids. A plate of glass or of polished metal laid on the surface of water and attached to one arm of a balance will support much more than its own weight in the opposite scale from the force of adhesion between the water and the plate. Attraction between like particles is called *cohesion.*

ADIRONDACK, *ad i ron'dak,* **MOUNTAINS,** a group of mountains belonging to the Appalachian system, extending from the northeast corner of the state of New York to near its center. The scenery is wild and grand, diversified by numerous beautiful lakes, and the whole region is a favorite resort of sportsmen and tourists. About half of the range has been preserved in its natural beauty by state legislation constituting it a public park, and Cornell University maintains a school of forestry in one portion of the region. Mount Marcy, the highest peak in the range, is 5,344 feet in altitude, and there are a number of others over 4,500 feet high. Belonging to this group are two famous lakes, Champlain and George. Commercially the Adirondacks are valuable because of their wealth of timber, iron ore and building stone.

AD'JECTIVE, in grammar, the part of speech which is used to limit or define a noun or a word or phrase equivalent to a noun. One of the more common classifications of adjectives divides them into (1) descriptive adjectives, which include not only adjectives denoting quality, as *white, round, good,* but also numeral adjectives, as *one, two;* (2) pronominal adjectives, as *this, that.* In this latter class the articles are sometimes included (see ARTICLE). In the English language the adjective always precedes its noun unless it be a predicate adjective. English adjectives do not change their form for gender or number, but the adjectives of quality admit of comparison to express various degrees of the quality indicated.

To parse an adjective one should state to what class it belongs; give its degree of comparison, whether positive, comparative or superlative; and state its use in the sentence. See LANGUAGE AND GRAMMAR.

ADJUTANT, *aj'u tant,* a military staff officer appointed by a commanding officer to assist him in the discipline and training of his men, and in the general administration of his command. In the United States army the regimental adjutant has usually the rank of captain and is appointed for a term of four years. Squadron or battalion adjutants serve for two years.

ADJUTANT, a species of stork common in India, where it is protected by law because of its habit of destroying small noxious animals and acting as a scavenger. The adjutant has slate-colored back and wings, with white body and a nearly naked flesh-colored neck marked with black. It stands about five feet high, and has an enormous bill and an inflatable pouch under its neck. It was called adjutant bird because of the pompous airs it assumes, such as might be shown by a conceited army officer. (See next page.)

ADJUTANT-GENERAL, an assistant of the commanding general of a field army. It

is his task to aid his superior officer in giving and executing orders, making reports and

ADJUTANT

carrying out similar military duties. Such an officer usually holds the rank of colonel. In the United States army there is an Adjutant-General's Department, presided over by an officer of the War Department. He has the title of adjutant-general and usually the rank of brigadier-general, and is entrusted with the management of the recruiting service.

AD'LER, FELIX (1851–), an American lecturer and educator, born at Alzey, Germany. He emigrated to America at the age of six and was educated at Columbia College. On completion of his education in Germany he was appointed professor of Hebrew and Oriental literature at Cornell University, but is more generally known as the founder in New York of the Society for Ethical Culture, of which he became the lecturer. Under Dr. Adler's management the influence of this society became such as to secure the establishment of similar societies in other parts of the United States and in foreign countries. In 1902 Dr. Adler was appointed professor of social and political ethics in Columbia University. He wrote, among other works, *Creed and Deed* and *The Moral Instruction of Children.*

ADME'TUS, in Greek mythology, king of Pherae, in Thessaly, and husband of Alcestis, who gave signal proof of her attachment by consenting to die in order to prolong her husband's life. See ALCESTIS.

ADMIN'ISTRATOR, a person duly appointed by a probate court to administer the affairs of an estate, in case no executor had previously been named. Under the direction of the court he carries out the provisions of the will of a deceased person, and is responsible to the court for all his acts. See MINOR; WILL.

ADMIRAL, an officer who holds the highest rank in a navy, except when particular distinction is to be conferred, in which case, in the United States navy, the superior rank is *admiral of the navy.* This more exalted rank corresponds to the British "admiral of the fleet." Only one man, George Dewey, has been given this highest title in America, for it was not authorized until 1899.

There have always been three grades in the rank of admiral, as follows:

Admiral. This officer ranks with the general in the army. He ranks above all other naval officers except those bearing the same commission, and in such cases seniority governs.

Vice-Admiral, a title bestowed only on occasion when unusual naval activity demands an officer on certain duty with higher rank than rear-admiral. In the World War Rear-Admiral Sims, in charge of the American naval flotilla in European waters, was raised to this rank, to put him on an equality with officers of the British and French contingents with which he was operating. The grade of vice-admiral corresponds to that of lieutenant-general in the army.

Rear-Admiral, the lowest grade of admiral, in charge of a fleet of war vessels in absence of a ranking officer. This appointment corresponds to that of major-general in the army.

Rate of Pay. The admiral of the navy receives $13,500 per year; admiral, $10,000; vice-admiral, $9,000; rear-admiral, senior grade (including the half of the personnel oldest by seniority), $8,000; rear-admiral, junior grade, $6,000. When on active duty at sea there is an increase of ten per cent in the salary named. In 1918, because of largely increased navy personnel, the number of admirals of the three grades was as follows:

Admirals, four—Benson, Mayo, Caperton, Winterhalter.
Vice-admirals, three—Sims, Coffman, Grant.
Rear-admirals—sixty-two.

Upon retirement at the age of sixty-two, each officer thereafter receives three-fourths

of the pay he was drawing at the time of his retirement. See RANK IN ARMY AND NAVY; NAVY.

ADMIRALTY, a term relating to marine affairs. It refers in European governments to the executive (Ministry) office which has charge of naval affairs, the head official being called First Lord of the Admiralty. It also is the name applied to special courts which have jurisdiction over all maritime questions. There are no admiralty courts in the United States, all such litigation being vested in the United States District courts. All cases arising from the navigation of public waters come under their jurisdiction.

ADMIRALTY COURT OF CANADA. The exchequer court (see EXCHEQUER COURT OF CANADA) has the powers of an admiralty court, but with the development of commerce and the consequent increase in the number of questions for decision, it became necessary to establish separate courts to hear this class of cases. The court has jurisdiction in all civil cases in any way relating to navigation, shipping, trade and commerce in Canadian waters, tidal or non-tidal. The Governor-General may appoint a judge of a superior court, or of a county, or any barrister of not less than seven years' standing, to act as "local judge in admiralty." Admiralty business may be transacted either at the exchequer court in Ottawa, or in the district courts. At present there are seven admiralty districts, each presided over by a local judge in admiralty:

(1) Ontario, under the name of Toronto admiralty district, with offices in Toronto.
(2) Quebec, with offices at the city of Quebec.
(3) Nova Scotia, with offices at Halifax.
(4) New Brunswick, with offices at St. John.
(5) Prince Edward Island, with offices at Charlottetown.
(6) British Columbia, with offices at Victoria.
(7) Yukon Territory, with offices at Dawson.

ADOBE, *a doh'be,* the name of a sun-dried brick used in arid regions in Arizona, New Mexico and Mexico. The bricks are baked by exposing them to the sun for ten days or two weeks, during which time they are turned daily. They are mainly of two sizes, 18 x 9 x 4 inches, and 16 x 12 x 4 inches. When dried, the bricks are stacked for use. The large size are so laid in walls that the length of the brick will be crosswise, while the smaller size are laid lengthwise of the wall. These bricks are serviceable for building in dry climates, but they cannot be used where there is much rainfall. Bricks made in a similar manner were used by the ancient Egyptians and Babylonians in constructing most of their buildings.

ADOLESCENCE, *ad o les'ents,* a term applied to that period when the boy or girl emerges from childhood and reaches adulthood. In law the adolescent period for girls is from twelve to twenty-one, and for boys from fourteen to twenty-five. Educators point out that young people passing through this period need special guidance and training because of vital physical, moral and intellectual changes that are taking place. There is active growth of bones and muscles, and marked development of various internal organs. The nervous strain accompanying these changes makes healthful exercise, sufficient rest and wholesome outlet for the energies imperative, if the health of the adolescent is to be unimpaired.

In the early part of the adolescent period the powers of observation show great development, memory becomes very active, imagination is keen and the reasoning and judging powers grow stronger. There is a marked development of the moral tendencies in the early "teens," and young people at this age respond readily to religious influences. This is the period when they may be led to form important decisions for right living. The lofty, if romantic, ambitions of the adolescent should be encouraged, and the impulses to noble actions be turned into the proper channels. The social instincts, too, are active in the "teen-age" period, a fact that makes possible such organizations as the Boy Scouts and Camp Fire Girls. Because of the critical nature of the adolescent period, parents should study its tendencies with great care.

ADO'NIS, a genus of plants of the same family as the buttercup. In the corn-adonis or pheasant's eye the petals are bright scarlet like the blood of Adonis, from which the plant is said to have sprung.

ADONIS, *a doh'nis,* in classical mythology, a beautiful boy who was loved by Venus. He was killed during a boar hunt, and Venus, inconsolable, begged Proserpina for his return from the lower regions. It was finally agreed that the boy should spend eight months of the year on earth.

ADOP'TION, a legal term defining the process of accepting as one's own child the child of another. Adoption is regulated by legal statute in practically every state in the Union and in British possessions. Typical of this form of legislation are the following: Any competent party may adopt a child if consent to such adoption is obtained in writing from the child's living parents or guardians, or from the child, in case the latter has attained a certain age (usually 12 or 14 years). In most states only minors may be adopted. Adoption gives to the child all the rights of a natural son or daughter, including property rights by inheritance, if the process of adoption is carried out legally. It is very important that the papers by which adoption is recorded conform strictly to the regulations concerning them.

ADRIAN, the name of six Popes of Rome, no one of whom was noted for any great deeds.

Adrian IV, originally named Nicholas Breakspear, the only Englishman that ever occupied the Papal chair, was born about 1100 and died in 1159. He studied in France, became abbot of Saint Rufus in Provence, and Pope in 1154. During his reign was begun the long contest with the German House of Hohenstaufen, which finally brought about the overthrow of that dynasty.

Adrian V settled the dispute between King Henry III of England and his nobles in favor of the former, but died a month after his election to the Papal chair (1276).

ADRIAN, *a'dri an,* MICH., the county seat of Lenawee County, forty miles northwest of Toledo and seventy miles southwest of Detroit. The New York Central Lines, the Detroit, Toledo & Ironton and the Wabash Railroad provide transportation, and there is an electrical line. In this city the first woven wire fences were manufactured, and the industry is now important, six mills being engaged. The city is the seat of Adrian College, a Methodist Protestant school, and the state industrial school for girls is here. Population, 1910, 10,763; in 1917, 11,570 (Federal estimate).

ADRIANOPLE, *a dri an o' pl',* the most important military post of European Turkey, situated about 135 miles northwest of Constantinople, in ancient Thrace. The chief buildings are a great mosque, a palace now in ruins, a grand aqueduct and a splendid bazaar. The manufactures are silk, woolen and cotton stuffs, attar of roses and leathers. Adrianople was founded by the emperor Hadrian and was the capital of the Ottoman Empire from 1361 to 1453. Here was signed in 1829 a treaty between Russia and Turkey, in which the latter power recognized the independence of Greece. During the Balkan War, the city was besieged by the Bulgarians and Serbians for six months and surrendered on March 27, 1913, but on July 21 it was recaptured. On September 29 Bulgaria and Turkey signed the Treaty of Constantinople, by which Turkey received formal recognition of its claim to Adrianople and the outlying chain of fortifications. Population, about 81,000, consisting of Turks, Bulgarians, Armenians and Jews.

ADRIATIC, *ad re at' ik,* **SEA,** an arm of the Mediterranean, stretching in a northwesterly direction from the Straits of Otranto, between Italy on the west and the Balkan peninsula and Austria on the east. Its length is about 480 miles, its average breadth about 100 miles, and its area about 60,000 square miles. In the north it forms the Gulf of Venice and in the northeast the Gulf of Trieste. The Po River has carried so much silt into the sea that cities once on its coast are now inland. The rivalry between Austria and Italy for supremacy in the Adriatic was one of the causes of Italian intervention in the World War.

ADULTERA'TION, a term which covers a wide variety of processes by which articles offered to purchasers are in some way rendered inferior to an accepted standard. The adulterated article may be changed in quality, color, proportion of ingredients, etc., or it may be a substitute for the genuine commodity. Because consumers should be protected against unscrupulous adulteration and know exactly what they are buying, many governments have passed laws regulating the practice of adulteration. Legislation regarding foods comes under the head of *pure food laws,* and is discussed elsewhere in these volumes under that title.

It is a common practice to add substances to foods for the purpose of preserving them. While not all preservatives are actually harmful, they are usually objectionable because they reduce the flavor and nutritive value of the food. The use of poisonous preservatives is, of course, absolutely unjustifiable. Of the harmless preservatives, benzoate of soda, when used in small quantities, is the least objectionable. Sulphite of soda, used to neutralize the

odor and improve the appearance of decayed meat, is very objectionable. Butter and certain other foods are frequently made attractive by the addition of such artificial coloring matters as aniline and vegetable dyes (see BUTTER). There is no objection to this practice if the dyes used have been tested and certified as pure and harmless. Milk is adulterated by being diluted with water or by having the cream skimmed off. Good milk should have at least three per cent of fat and not more than 87.2 per cent of water.

Fruit preserves, jams and jellies are also subject to adulteration. The use of corn syrup or glucose for sugar does not reduce the purity of the preserve, but it lessens its sweetness. Less justifiable is the substitution of artificial flavoring and coloring matters for the pure fruit juice, or the use of a preservative to shorten the process of sterilizing. Glucose may be safely employed in the manufacture of confectionery, but the use of poisonous coloring matter is dangerous to health. Pure candy is colored with certified dyes. Spices and condiments, too, are marketed in debased form. Pepper and other ground spices receive additions of sawdust, nut shells, linseed meal and the like; pickles are colored by salts of copper. Because of its high price olive oil is cheapened by being mixed with cottonseed and other vegetable oils. Ground chicory, roasted wheat, acorns and rye are common ingredients of cheap coffee, burned sugar being used to color the mixture.

The adulteration of clothing materials is a custom which is not necessarily objectionable if no fraud is practiced. Mercerized cotton, a fabric made out of cotton fibers which have been treated chemically, has a gloss similar to that of silk and is much cheaper than the genuine silk fabric. What is known as *shoddy* is a cloth made of wool fibers taken from cast-off garments. Though the name has unpleasant associations, a good grade of shoddy makes a cheap and an attractive garment and one that wears well. Shoddy should never be sold, however, for a genuine wool fabric.

AD'VENTISTS, several religious sects which, accepting the general doctrines of Christianity, expect a second personal coming of Christ and the early end of the world. All arose from the preaching of William Miller, who began in 1831 to prophesy the end of the world and the establishment of Christ's kingdom in 1843. Since the passing of that date the Adventists have been simply waiting for the appearance of Christ and make no attempt to fix the date. The Adventists are now separated into a number of different sects, of which the Church of God, the Evangelical Adventists, the Age-to-Come Adventists and the Life and Advent Union are small and local. The Advent Christians, who number more than 30,000 in the United States, have over 640 churches and sustain foreign missions in England and Asiatic countries. *The World's Crisis* is a leading publication. The largest sect dates from a meeting held at Washington, New Hampshire, in 1845. See SEVENTH DAY ADVENTISTS.

AD'VERB, in grammar, the part of speech which is used to limit or modify a verb, an adjective or another adverb. Adverbs may be classified as follows: (1) Adverbs of place, as *here, there*; (2) of time, as *now, again*; (3) of number, as *once, first*; (4) of manner, as *how, well*; (5) of degree, as *very, more*; (6) of cause, as *why*; (7) of assertion or denial, as *yes, no*. The largest class of adverbs in English is formed from adjectives by the addition of the syllable *ly*, as *slow, slowly*. Adverbs do not change their form in comparison, as do adjectives, but are compared by the use of *more* and *most*.

To parse an adverb one should state the kind of adverb it is; its degree of comparison, whether positive, comparative or superlative; and its use in the sentence.

ADVERTISING, *ad ver tyz'ing*, a term especially applied to printed announcements in newspapers and magazines and upon billboards by which manufacturers or merchants make known their goods to prospective purchasers. It also includes, in a less important degree, catalogues, booklets, printed circulars, circular letters, electric signs, street-car advertising and announcements on moving-picture films.

Advertising is divided into two general classes, called *direct* and *indirect*. The first seeks to establish relations between the advertiser, as seller, and the purchaser, by direct sale. The second class merely directs public attention to the merit and desirability of wares with the hope that people will be led to purchase the articles from local merchants.

This second class of announcements, known also as *publicity* advertising, requires large expenditures over wide territory, and long continued effort, to achieve success, and even with very heavy appropriations often results in failure. Publicity advertising requires at least $100,000 expenditure in a year; very often a single firm will spend several times that amount.

Money received from advertising constitutes the major portion of a publication's income, as a rule. Were it not for advertising any newspaper or magazine would cost its reader from five to ten times the sum now charged; the advertiser is thus a benefactor of the reading public at the same time that he seeks legitimate profits. A single-page advertisement in a publication of very large circulation may cost $5,000 for one insertion; it may reach from 3,000,000 to 5,000,000 people.

ADZ, a tool used by carpenters for smoothing timber. It has an edge shaped like a chisel and from four to five inches long. The head is curved and has a socket for the handle, which is straight and about three feet long. The line of the edge is crosswise to that of the handle. The cooper's adz has a short handle and is used with one hand. An adz used for making eave-troughs and hollow ware has the blade shaped like a gouge.

ADZ

AEGEAN, *e je'an*, **SEA**, that part of the Mediterranean which washes the eastern shores of Greece, the southern coast of Turkey and the western coast of Asia Minor. Its length is about 400 miles and its breath 175 miles at the widest point. It contains numerous islands, many of which are of volcanic origin. The chief ones are Euboea, Chios, Lesbos, Lemnos and Samos.

AEGIS, *e'jis*, according to Homer, the shield of Jupiter. It was borne either by Jupiter or by Minerva, and according to some legends had the Gorgon's head fastened in its center. The ancients believed that it thundered when Jupiter shook the aegis.

AENEAS, *e ne'as*, a Trojan warrior who, according to Homer, was next to Hector in bravery and in prominence during the Trojan War. The account of his wanderings after the fall of his city forms the theme of Vergil's *Aeneid*. See AENEID.

AENEID, *e ne'id*, a great Roman epic poem, by Vergil, which recounts the wanderings of Aeneas. It is divided into twelve books, of which the first six are modeled to some extent upon the *Odyssey*, the last six upon the *Iliad*. The gods are represented as taking part in the affairs of men, and as being divided in their councils respecting the fate of mortals. Indeed, it is the hatred of Juno that brings upon Aeneas all his woe, while Venus toils to thwart the plans of the hostile goddess and bring her beloved Trojans to Latium. Summarized briefly, the story is as follows:

The hero appears, in the sixth year of his wanderings, sailing from Sicily. Juno succeeds in bringing about a terrible storm, during which Aeneas is shipwrecked upon the coast of Africa. He is kindly received by Dido, queen of Carthage, and to her relates the story of the fall of Troy, the burning of the city, his escape to Mount Ida and his varied wanderings and perils until at last he reached Sicily, where he buried his father,

AENEAS AT THE COURT OF DIDO
Guerin

Anchises, whom he had carried on his shoulders from the burning city.

By the stratagems of Venus, Dido is made to fall in love with Aeneas, to whom she offers her hand and crown. Obeying the command of the gods, the hero leaves Carthage, and Dido, in rage and despair, dies by her own hand. Aeneas sails for Italy, but is driven ashore in Sicily. The fleet is set on fire by the Trojan women, but is saved by Jupiter, and Aeneas continues his voyage and reaches Italy. Here he visits

the Sibyl of Cumae, who conducts him down to the infernal regions, where his father Anchises tells him of the fate in store for him and his descendants, the Romans. After reaching Latium, his destination, Aeneas makes a treaty with Latinus, king of the region about the mouth of the Tiber, and is promised his daughter, Lavinia, in marriage. Juno interferes to break the treaty and brings on a war with the neighboring kings, in which the Trojans are at length victorious. The Julian family traced descent from Aeneas.

Related Articles. Consult the following titles for additional information:
Dido Troy Vergil

AEOLUS, *e'o lus*, in Greek mythology, the god of the winds, which he kept confined in a cave in the Aeolian Islands, releasing them when he wished or when he was commanded by his superiors among the gods. The winds are represented as his sons, and they are described as follows: Boreas, the north wind; Corus, the northwest wind; Aquilo, the west wind; Notus, the southwest wind; Eurus, the east wind; Zephyrus, the south wind.

AERONAUTICS. See BALLOON; FLYING MACHINE.

AEROSTATIC PRESS, a simple contrivance for rendering the pressure of the atmosphere available for extracting the coloring matter from dye-woods, and for similar purposes. A horizontal partition divides the machine into two parts. The lower part is connected with an air-pump, by means of which the air can be withdrawn from it. The substance from which the coloring matter is to be extracted is laid upon the partition, which is perforated, and a perforated cover is placed over it. Upon this the liquid intended to form the extract is poured, and as the air is extracted from the lower vessel by the pump, the pressure of the atmosphere forces the liquid through the substance and this extracts the coloring matter.

AESCHINES, *es'ki neez* (389–314 B. C.), a celebrated Athenian orator, the rival and opponent of Demosthenes. He headed the Macedonian party in Greece, or those in favor of an alliance with Philip, while Demosthenes took the opposite side. Having failed in 330 B. C. in the prosecution against Ctesiphon for proposing to bestow a crown of gold upon Demosthenes for his services to the state, he withdrew from Athens. Subsequently he established a school of eloquence at Rhodes.

AESCHYLUS, *es'ki lus*, (525?–456 B. C.), the earliest of the three great writers of Greek tragedy. He was of noble family, according to legend a descendant of Codrus, the last king of Athens. His father was probably connected with the worship of Ceres, and Aeschylus himself was early familiar with the Eleusinian Mysteries, strange religious rites into which he was afterward initiated. Aeschylus first won fame, not by poetry, but by bravery on the battlefield during the Persian wars. This military experience probably had an influence on his work in two ways: it turned his thoughts to patriotic studies and the glorification of his country, and it disposed the Athenians to regard his work favorably. For distinguished valor at Marathon (490 B. C.), he, with his two brothers, received public honors.

The first success of Aeschylus in a dramatic competition was won in 485 B. C., and we are told that this was the first of thirteen such successes. In the latter part of his life he was defeated by Simonides in the contest for a prize offered for the best elegy on those who fell at Marathon. Aeschylus spent most of his latter years in Sicily and died there, according to an improbable legend, as the result of a blow upon the head from a tortoise which an eagle dropped.

Of the seventy dramas of Aeschylus, but seven are preserved, in addition to a few fragments. These are *The Persians, The Suppliants, Prometheus Bound, The Seven against Thebes, Agamemnon, Choëphori* and *Eumenides*. The three last named form a trilogy. The *Prometheus* is perhaps the best known to English readers through Mrs. Browning's poetical version. Aeschylus introduced a second actor, and was the first to provide appropriate scenery and costumes. In style, the tragedies of Aeschylus are grand and somber, as befits their themes.

AESCULAPIUS, *es ku la'pi us*, in classical mythology, the god of medicine, usually said to have been the son of Apollo. He was entrusted in his youth to the centaur Chiron, who taught him the art of healing. So skillful did he become that he was able to bring the dead to life, and for this, Jupiter, at the request of Pluto, who disliked to be robbed of his victims, killed Aesculapius with a thunderbolt. In art the god of medi-

cine was usually represented as carrying a knotted staff, round which was entwined a serpent, the symbol of health.

AESOP, *e'sop,* a famous Greek writer of fables, is said to have been a contemporary of Croesus and Solon about the middle of the sixth century B. C. He visited the court of Croesus, and is also said to have visited Pisistratus at Athens. Finally he was sent by Croesus to Delphi to distribute a sum of money among the citizens. For some reason he refused to distribute the money, whereupon the Delphians, enraged, threw him from a precipice and killed him. Much of the account of Aesop is probably only legend, and it is possible that such a man never existed. The fables called by his name were not written until long after he is supposed to have lived. In modern times several collections have been published. Among the most familiar of these fables are *The Fox and the Grapes, The Wolf and the Lamb, The Ass in the Lion's Skin, The Lion and the Mouse* and *The Ox and the Frog.* See FABLE.

AESTHETICS, *es thet'iks.* See ESTHETICS.

AFFIDA'VIT, a document generally used when evidence is to be laid before a judge or a court, while evidence brought before a jury is delivered orally. The person making the affidavit signs his name at the bottom of it, and swears that the statements contained in it are true. An affidavit made in good faith is accepted as on a par with personal testimony.

AFFIN'ITY. See RELATIONSHIP.

AFFIN'ITY, in chemistry, that force by means of which two or more substances unite to form a compound in which the properties of each substance are lost; as, oxygen and hydrogen unite to form water, and hydrogen and chlorine to form hydrochloric acid. We do not know the nature of this force, but it is present to a greater or less extent in all substances. In some elements, such as oxygen and chlorine, it is strong, and these unite to form a large number of compounds; in others, like nitrogen and argon, it is very weak, and these have but few compounds. Elements unite only in definite proportions, as atom for atom in the case of hydrogen and chlorine, or two atoms of one to one of the other, as in case of hydrogen and oxygen in forming water. Some elements unite in proportion of three atoms of one to two of another, and so on. The proportions are always the same for the same elements, but they may vary by multiples (see ATOMIC THEORY). The action resulting from chemical affinity usually produces more or less heat. Heat, also, may destroy this force and separate the compound into its elements, as, when steam is passed through a red-hot tube it is separated into oxygen and hydrogen.

Afghan Chief

AFGHANISTAN, *af gan'i stan,* an interior country of Asia, important politically because of its position, but possessing little of commerce, wealth or progress. Before the collapse of Russia in 1918 that country and Great Britain had joint interests surrounding Afghanistan; Russia, because it was a barrier between its sphere of influence in Asia and the Indian empire of Great Britain; Britain because it protected India from any power which sought an invasion of India through Afghan's mountain passes. While Afghanistan's government is practically independent, the country acknowledges Britain's influence in all foreign relations.

The People and the Government. Afghanistan is a Mohammedan monarchy, with leanings towards absolutism, but the ruler, called the ameer, is obliged often to defer to the powerful, quarrelsome tribes who comprise most of the rural population. The people are members of the original Afghan race, and are divided into tribes and clans; the autocratic power of the ameer cannot always control them. The Afghan language has taken a large number of Persian words, so the original tongue is no longer in evidence. Arabic characters are used in writing.

The present ameer is Habib Ullah Khan, who succeeded his father in 1901. His royal income from his country is about $4,000,000, supplemented by an annuity of $600,000 from the British government.

The principal towns are Kabul, the capital, with 180,000 people; Kandahar, between 40,000 and 80,000 (the number is not

known); and Herat, 20,000. The entire country is estimated to possess 5,000,000 people, and the area is about 225,000 square miles.

The Land. The country consists largely of lofty, bare uninhabited tablelands, sandy, barren plains, ranges of snow-covered mountains and deep ravines and valleys. Some of the valleys are well watered and fertile, but by far the larger part of the whole surface is rocky and unproductive. The climate is extremely cold in the higher, and intensely hot in the lower regions. Fruits of many varieties grow wild in the valleys, and the principal crops raised are wheat, barley, rice, maize, tobacco, sugar-cane and cotton.

History. The history of Afghanistan from the time of Alexander the Great to the eighteenth century consists merely in a series of conquests made by different nations. In 1738 the country was conquered by the Persians and for a number of years a tolerably strong government was maintained. About 1825 Dost Mohammed succeeded in gaining a preponderating influence in the country, which, from the date of the exile of its ruler, Shah Shuja, had been in a state of anarchy. In 1839 the British army entered the country, occupied Kabul and replaced Shah Shuja on the throne; but two years later a widespread insurrection occurred among the Afghans; a number of British officers, women and children were murdered, and in the following year the British left Kabul. Soon, however, a fresh army came from India, retook Kabul and finished the war. Shah Shuja had been assassinated and Dost Mohammed again obtained the throne. He died in 1863 and left as his successor his son, Shere Ali, who for a time maintained friendly relations with the British. War was declared against him, however, in 1878; the British troops entered Afghanistan, the ameer fled to Turkestan and his son, Yakub Khan, who succeeded him, concluded a treaty with the British in 1879. The extension of the British frontier, the control by Britain of the foreign policy of Afghanistan and the residence of a British envoy in Kabul were the chief stipulations of the treaty.

Encroachments by the Russians on territory claimed by Afghanistan almost brought about a rupture between Britain and Russia in 1885. In 1907 all differences appeared to be adjusted by a treaty which recognized Afghanistan as outside of Russia's sphere of influence.

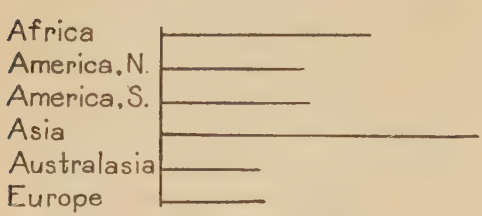
On the greatest of deserts

AFRICA, next to Asia, is the largest of the world's major land divisions. Unlike Asia, Europe and North America, it has within its boundaries no world powers, and its often-quoted name, the "Dark Continent," seems not inappropriate when one considers its many regions still untouched by civilization. Only two independent states are found in Africa, and these are of minor importance. They are the negro republic of Liberia, and Abyssinia. Egypt, the home of one of the world's most ancient civilizations, is now under British control, and the continent's most progressive section, known as South Africa, is also a part of the British Empire. In fact, vast sections of this great land division are colonial possessions of the white race.

Africa has an area of about 11,500,000 square miles, including the islands belonging to it geographically. Its length and greatest breadth are nearly the same—5,000 and 4,500 miles—but the southern part tapers down to form the apex of a triangle, though not so sharply as do North and South America. Because of the comparative regularity of its coast line, Africa has few coast waters of special significance, and the total extent of its seacoast is only 18,400 miles. Europe, with an area one-third as great, has a coast line only about 1,000 miles shorter. The surrounding waters are the Mediterranean Sea and Strait of Gibraltar on the north, the Atlantic Ocean on the south, and the Indian Ocean, Gulf of Aden and Red Sea on the east. Aside from the Gulf of Guinea, which fills the great bend in the western coast, and the indentation which forms the Red Sea on the northeast, there are no coast waters of great importance. On the north are the two small gulfs of Gabes and Sidra, formerly known as the Great and Lesser Syrtes.

Africa is joined to Asia by the Isthmus of Suez, and barely separated from Europe

by the Strait of Gibraltar, which in its narrowest place is only eight and one-half miles wide. It is therefore in reality a gigantic



COMPARATIVE AREAS

peninsula. The important projections are capes Bon on the north, Verde on the west, Good Hope on the south and Guardafui on the east. The islands are few, and with the exception of Madagascar, the most important groups geographically connected with the continent are the Madeira Islands, and Canaries and the Cape Verde Islands. Single islands of some geographic and historic importance are Fernando Po, Saint Helena, Saint Thomas, Ascension, Saint Mary, Bourbon and Mauritius.

Inhabitants. Africa is peopled by four races, the Semitic and Hamitic races in the north, and the negro and Hottentot races in the central and southern portions. From time immemorial Northern Africa has been the home of the white race, and equatorial and Southern Africa the home of the colored race; but these have gradually intermingled so that the Sudan is peopled by a mixed race. Frequent conquests by the Mediterranean countries have also caused so many changes in the population that race distinctions are now difficult to trace. The equatorial regions are peopled by the negro race belonging to the branch generally known as the Bantus. This branch is very extensive and includes all of the tribes from the region south of the Sudan to the country of the Hottentots, almost in the extreme southeastern portion of the continent. The various tribes inhabiting this vast section differ from one another in size, color and features; yet they all speak kindred languages and possess numerous other points of resemblance, sufficient to classify them as belonging to the Bantu branch. A rare exception to these tribes is found in the dwarfs dwelling in the dense forests along the Aruwimi.

The Hottentots, inhabitating the southeastern portion of the continent, are undoubtedly a branch of the negro race, but they differ from the Bantus in color, in general features and in language. The most important nations inhabiting this part of the continent are the Kaffirs, Bushmen and Hottentots. These have now all been brought under the control of the British government.

The best authorities estimate the population of Africa at about 140,000,000, but the number of people in the interior is not definitely known.

Political Divisions. Since 1875 the political map of Africa has been almost entirely changed. The modifications have been due to the rapid progress of explorations, to conflicts with some of the native tribes and to the predominating influence which some of the great powers of Europe exercise. The principal political divisions at the outbreak of the World War in 1914 were as follows:

Independent states: Abyssinia and Liberia.

Great Britain: East Africa protectorate, Uganda protectorate, Nyassaland protectorate, Rhodesia (governed by the British South Africa Company), Swaziland, Union of South Africa, Nigeria colony and protectorate, Gambia colony and protectorate, Gold Coast colony and protectorate, Ashanti, Sierra Leone colony and protectorate, Egypt protectorate, Sudan; area over 3,000,000 square miles; population, about 50,000,000.

France: Algeria, Congo, Madagascar, Mayotte, Comoro Islands, Somali protectorate, Senegal, Guinea, Ivory Coast, Dahomey, Upper Senegal and Niger, Niger territory, Mauritania, Tunis protectorate, Morocco protectorate; area, about 3,000,000 square miles; population, about 40,000,000 (estimate).

Belgium: Congo, formerly the Congo Free State; area, 909,654 square miles; population, about 15,000,000.

Italy: Eritrea, Somaliland colony and protectorate, Tripoli and Cyrenaica; area, about 600,000 square miles; population, about 1,400,000.

Portugal: Cape Verde Islands, Guinea, Saint Thomas and Principe, Angola, Mozambique; area, 793,980 square miles; population, 8,245,032.

Spain: Canary Islands, Rio de Oro and Adrar, Guinea, Fernando Po, Morocco protectorate; area, about 100,000 square miles; population, about 2,500,000.

Germany: Until 1917, Kamerun, East Africa, Southwest Africa, Togoland; area, 931,460 square miles. The German possessions were occupied by the Allies during the World War. Their disposition was left to the Peace Conference. Great Britain took a mandate for German East Africa; the Union of South Africa accepted a mandate for Southwest Africa.

Surface and Drainage. In general, Africa consists of a plateau which rises abruptly

EUROPE
ATLANTIC OCEAN
FRANCE
SPAIN
PORTUGAL
MADRID
LISBON
CORSICA
SARDINIA
ROME
ITALY
MEDITERRANEAN SEA
ALGIERS
TUNIS
TRIPOLI
BENGAZI
CYRENAICA
TRIPOLITANIA
ROUMANIA
BULGARIA
SERBIA
GREECE
ADRIATIC SEA
BLACK SEA
CONSTANTINOPLE
TURKEY
ASIA MINOR
ATHENS
SMYRNA
CRETE
CYPRUS
CASPIAN SEA
PERSIA
Damascus
Baghdad
Jerusalem
Alexandria
Port Said
Suez
CAIRO
Tanta
Benha
Matruh
Siwa
Medinet el-Faiyum
El-Minya
Assiut
Akhmim
Keneh
Kharga
Aswan
1st Cataract
Ras Banas
Kosseir
Wady Halfa
2nd Cataract
3rd Cataract
4th Cataract
5th Cataract
6th Cataract
Abu Hamed
Port Sudan
Suakin
Atbara
Ras Kasar
Mecca
Ras Rawai
C. Elba
Ras Benas
Kowet
PERSIAN GULF
JEBEL SHAMMAR
NEJD
El-Medina
ARABIA
RED SEA
EGYPT
LIBYAN DESERT
TRIPOLI (LIBIA ITALIANA)
FEZZAN
Murzuk
Wau
Suila
Taiserbo
Oasis of Kufra
Ghat
Ghadames
Hammada el Homra
Casis el Jofra
Sokna
Tummo
Oasis Jebado
TIBESTI OR TU
DESERT
SAHARA
Tademait Plateau
Muydir Plateau
Amguid
AHAGGAR
TASILI N' AHAGGAR
TINGHERT
EL EGLAB
TROPIC OF CANCER
Ideles
Issala
Tamenrasset
Timmissao
Hammada Tuman
Areg el Shesh
Tauden
Bir Onan
EL JUF
ADRAR
Adrar Sutuf
Tidjikdja
Arawen
Tisbit
Infoucan
Oasis Kawar
Oasis Bilma
Bauchsen Mts.
MILITARY TERRITORIES
Agades
Tembelaga
Zinder
Damlerghu
Kanem
Lake Chad
Bosso
Mao
Abeshr
Safe
Yao
Kuka
Kousseri
Massenya
Kano
Sokoto
Zaria
Bauchi
Ilo
Nguru
Yola
Kelfi
Jebba
Save
Ilorin
Udi
Asaba
Warri
Port Harcourt
Bonny
Brass
Calabar
Victoria
Buea
Duala
Yaunde
Kribi
Fernando Po
Rio del Rey
Cameroons Mt.
Rumby
Nigeria
Kamerun
Ubangi-Shari
Fr. de Possel
Bangui
Libinge
Lisala
Mangara
Djabir
Baran-Bakia
Rafai
Ft. Archambault
Ft. Lamy
Ft. Crampel
Ft. Archambault
Bahr el Ghazal
Ladoo
Dulo
Lado
Kuidolph
Lugh
Italia
Bardera
Uganda Prot.
East
Kenia
Mt. Elgon
Victoria Nyanza
Lake Albert
Albert Nyanza
Lake Rudolf
Abyssinia
Addis Ababa
Gambela
Gore
Ankober
Dire Daua
Harrar
Somaliland Prot.
Italian Somaliland
Obbia
Mudugh
Gulf of Aden
Djibouti
Zeila
Bulhar
Berbera
Socotra
Broughton I.
C. Guardafui
Aden
Hadramaut
Yemen
Hodeida
Mocha
Loheia
Abu Arish
Kamaran I.
Massaua
Kassala
Asmara
Keren
Agordat
Gondar
Debra Tabor
Lake Tana
Abbai R.
Blue Nile
White Nile
Khartum
Omdurman
Wad-Medani
Sennar
Kobe
El Fasher
Kordofan
El Obeid
Dar Fur
Darfur
Sudan
Anglo-Egyptian
Egyptian
Abtalo
Axum
Adowa
Asaba
Maguala
Debra Tabor
Ankober
Gambela
Gore
Dire Daua
Harrar
Somaliland Prot.
Addis Ababa
Abyssinia

AFRICA

SCALE OF MILES

0 100 200 300 400 500 600 700 800 900 1000

REFERENCE

British	Portuguese
French	Spanish
Italian	Belgian
Former German Colonies: Under British Control	
Former German Colonies: Under French Control	

Hammond's 8 x 11 Map of Africa

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RELIEF MAP OF AFRICA

from the ocean, with narrow lowlands at its base. Upon this plateau rise disconnected mountains and fragments of ranges. The great bend in the western coast naturally divides the surface into two sections, the northern, which is approximately elliptical in form, and the southern, which is roughly triangular. The northern division is considerably lower than the southern, but it contains an important mountain range, the Atlas, running parallel to the southern coast of the Mediterranean and attaining its greatest height in the western half, where some of the peaks exceed 14,000 feet. Toward the east it descends rapidly and is followed by some depressions that are below the sea level. On the south the Atlas range slopes directly to the plateau which forms the Sahara. This region has an irregular surface containing small plateaus of different degrees of elevation separated by *wadys,* or the valleys of dried-up streams. Running across these plateaus are ranges of hills and low mountains, which extend in various directions. (See SAHARA.) South of the Sahara is the Sudan, which extends to the Gulf of Guinea. This is a still lower region and has a surface consisting of plains and valleys interspersed with hills. To the southwest of the Sudan are the Kamerun Mountains, a low range which forms the highlands at the head of the Gulf of Guinea.

Extending southward from the vicinity of the Red Sea is the most important ridge of highlands. This attains its greatest elevation in the vicinity of mounts Kenia and Kilimanjaro, which are the most lofty peaks on the continent, the former having an elevation of over 18,000 feet and the latter of 19,750 feet. In the equatorial regions this highland is broken up into a number of parallel ridges, and between these are found the basins which contain the great lakes, Victoria Nyanza, Albert Nyanza and Tanganyika. Proceeding southward from Kilimanjaro, this highland takes the form of a mountain range and is known as the Drakenberg Mountains, which attain an altitude of 10,000 feet and extend to the southern extremity of the continent. On the western side of the southern plateau the highlands are lower, but the average altitude of this portion of the continent is about 4,000 feet, while that of the northern section is but a little over 2,000 feet.

The relief of the continent exerts an important influence over its drainage. Of the four great river systems all but one, the Zambezi, flow into the Atlantic or its tributary waters. Of these, the Nile and the Congo have their head waters in or near the equatorial regions. Where the streams flow over the edge of the plateau they contain falls which obstruct navigation. The celebrated cataracts of the Nile, the rapids in the Congo at Leopoldville, and Victoria Falls, on the Zambezi, are among the best illustrations of these cataracts, which are described in the articles upon their respective rivers. In the western portion of the northern projection of the continent the Senegal and Niger are the most important streams. The latter has its source quite near the coast and makes a remarkable bend before discharging its waters into the gulf. The southern portion of the continent is drained by the Orange and its tributaries flowing into the Atlantic, and the Limpopo into the Indian Ocean. To the north of the Zambezi are the Rovuma, Tana, Juba and Shebli, all comparatively unimportant streams.

Aside from North America, Africa contains the largest fresh-water lakes. Leading these is the Victoria Nyanza, approximately circular in form and having a diameter of about 180 miles. Next to Lake Superior it is the largest body of fresh water on the globe. The other lakes found in this portion of the continent are Albert Nyanza, Albert Edward, Tanganyika and Nyassa. Directly west of Nyassa is Lake Bangweolo, in which the Congo has its source. Lake Chad, in the center of the Sudan, is an important inland lake with no outlet. Salt lakes are comparatively few and small.

Mineral Resources. But little is yet known of the geology of Africa, but so far as it has been studied, the indications are that the continent has been subject to fewer convulsions than those to the north, and the formations seem to be more regular than in Europe, Asia or America. Among the rocks are found many excellent building stones. The granite and syenite of the Nile basin have been known to the civilized world since the days of the Pharaohs. Extensive deposits of granite are also found along the Orange River, and deposits of sandstone and other stones are found to the north of the Orange River and in other localities. Iron and copper are also distributed over the continent. The Congo basin contains valuable

Bamboo

Olive

Papyrus

Ebony

Cork Tree

Cypress

Date Palm

Acacia

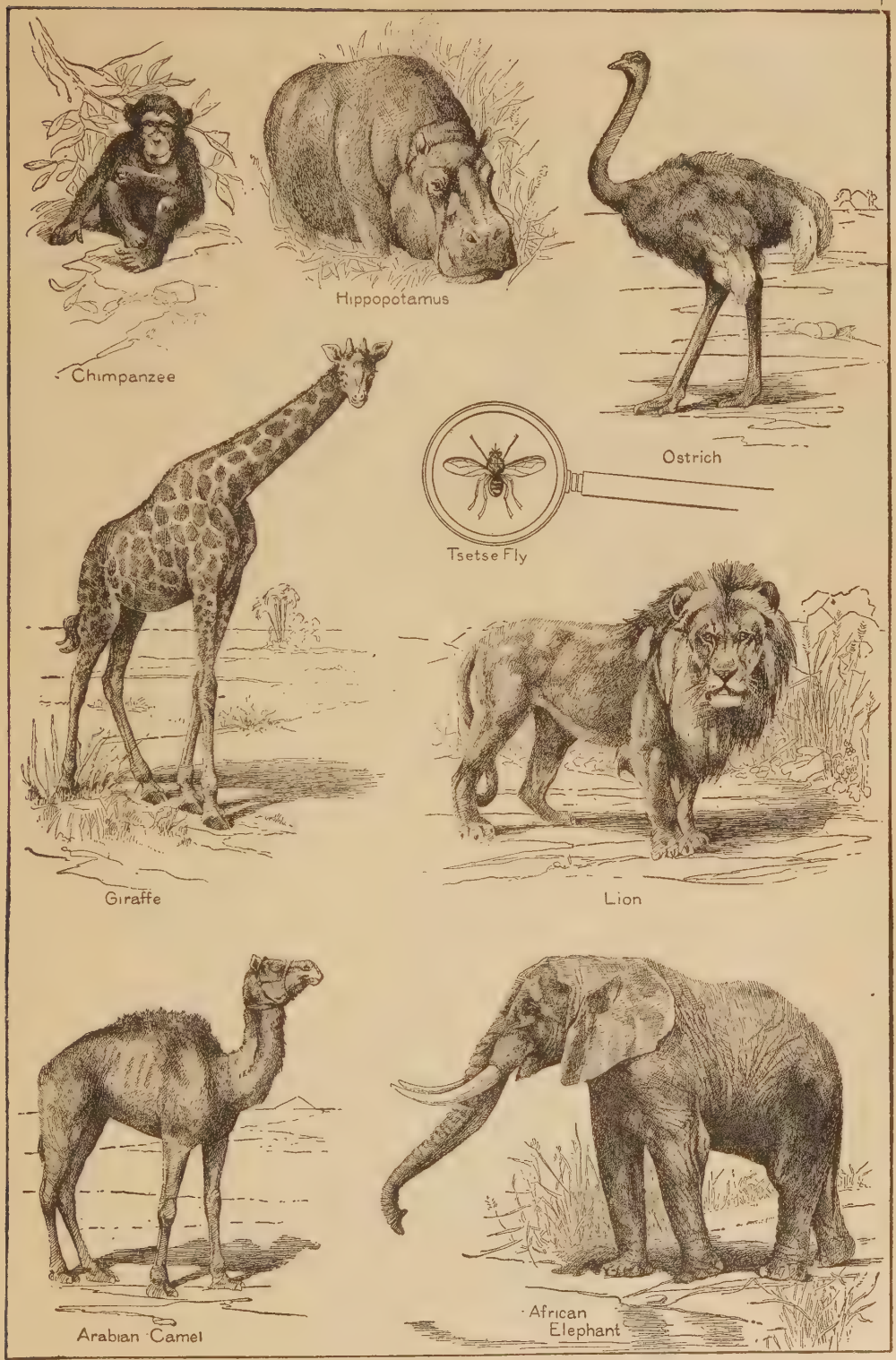
deposits of these ores, and some of the native tribes have attained considerable skill in fashioning the iron into agricultural implements and weapons, but none of the mines has been in the least developed. Coal has been found in paying quantities near the Zambezi River and is known to exist in some other sections, but no systematic survey has yet been made to determine the extent and value of the deposits. The most valuable mineral region as far as known consists of the diamond and gold regions in South Africa, the former near Kimberley in the northern part of Cape Colony, and the latter in Transvaal Colony. The diamond mines at Kimberley were opened in 1868, and since that time more than $400,000,000 worth of diamonds in the rough have been taken from them. They produce about 98 per cent of the world's output of this precious stone. The gold mines near Johannesburg were opened in 1883, and their value increased rapidly until at the breaking out of the Boer War in 1897 it was $55,000,000 a year. During that conflict operations practically ceased, but since then the mines have been rapidly developed, and their yearly output is now about $152,000,000.

Climate. The climate of Africa is more uniform than that of any other continent. This is due largely to the fact that the equator crosses it almost midway between the northern and southern extremities; therefore, the temperature gradually diminishes from the central portion of the continent toward the north and the south. The climate can be divided into tropical and warm temperate. The tropical region extends on the north almost to the northern boundary of the Sahara, and because of altitude and other local conditions the region of greatest heat is found between the tenth and twentieth parallels of north latitude. To the north of the Sahara and in the region of the Atlas Mountains the climate very closely resembles that of southern Europe, but in the Sahara there is a marked difference between summer and winter. During the winter this is an area of high pressure and the wind blows outward, while during the summer the intense heat of the sun causes sea breezes, but because of the hot surface over which these blow, they are dry winds, and the region seldom has any rain.

The altitude of the southern part of the continent gives it a cooler climate in corresponding latitudes than is found in the northern. Even in the equatorial regions the interior is healthful, and Europeans can reside there without difficulty, while in the same latitude, with scarcely any exception, the low regions along the coast prove fatal to white men. South Africa has a temperate climate corresponding quite closely to that found in the states of Virginia, Kentucky and Tennessee.

The distribution of rainfall is very unequal. In the equatorial regions, especially along the course of the Congo, the precipitation is very heavy. Here there are two rainy seasons in the year, caused by the vertical position of the sun, but as we go north or south from this region the rainfall diminishes, and in the temperate regions there is practically only one rainy season each year; over portions of the Sahara no rain ever falls, and over the rest of it, very little. The arid region south of the Zambezi, forming the so-called Desert of Kalahari, is not totally devoid of rain and has enough moisture to make it a profitable grazing country. To the south of this the rainfall is frequent throughout the year, and agriculture can be successfully followed.

Vegetation. The vegetation is very closely related to the rainfall. In the northern portion of the continent the oak and olive are found, as are the semi-tropical fruits, grains and vegetables common to the countries of southern Europe. The inhabitants of Algiers, Morocco and other states bordering upon the Mediterranean derive considerable income by exporting these products to Europe. As we go southward from this region the vegetation becomes very scarce until at the Sahara it ceases altogether, except in the isolated cases where springs are found, but as we near the northern coast of the Gulf of Guinea, the desert yields to the savanna region which characterizes most of the Sudan. This is composed of open country covered with herbage and interspersed with groups of forest. From the Gambia River to the coast, and extending southward to within a short distance of the mouth of the Congo and thence eastward almost to Victoria Nyanza, there is an area of tropical forest which, for extent, size, variety of trees and density of vegetation, is equaled only by the forests of the Amazon. The region covered by this forest is more than half as large as the United States, and over most of



ANIMALS OF AFRICA

this the vegetation is so dense that the sun seldom penetrates to the ground. A few other forest regions are found. These are in Abyssinia, around the sources of the Congo, in British Central Africa and along the coast of German East Africa.

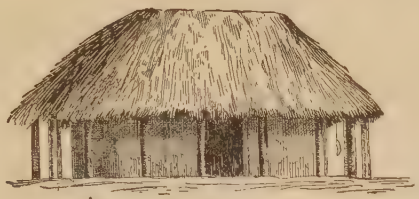
With these exceptions, south of the great forest area the savanna belt extends across the continent until the Zambezi River is reached. From this, the southwestern portion almost to the Cape of Good Hope is arid, and a narrow strip along the western coast is almost a desert. This region follows the coast northward as far as the tenth parallel of south latitude. The corresponding portions of the east coast contain forests and open country and are sufficiently well watered to admit of successful agriculture. The trees in these regions, as well as other forms of vegetation, are peculiar to the locality, a fact undoubtedly due to the distance of this portion of the continent from other land masses. The interior of the plateau contains extensive areas which are valuable for grazing and other agricultural purposes. Many varieties of palm are found in the warm temperate regions on both sides of the equatorial belt.

Animal Life. Africa is the home of the largest members of the animal kingdom, and owing to the absence of great central mountain barriers they may be found in all regions without special modification of type. Among the carnivorous animals are the lion, the panther, hyena, leopard, fox and jackal. The leading herbivorous animals are the elephant, rhinoceros, buffalo, giraffe and hippopotamus. Several species of antelopes are also found. The monkey family is spread over the whole continent, represented by numerous types such as the Barbary ape, the dog-faced baboon, the Gallago lemur and the anthropoid chimpanzee and gorilla. Animals resembling the horse are the zebra, quagga, the pigmy Mauritanian ass and the camel. Of the mammals there are about 500 species peculiar to this continent, of which about 50 are of the antelope family. Among the birds found in Africa are the ostrich, secretary, ibis, guinea fowl, weaver bird, roller bird, love bird, wax bill, sun bird, parrot, quail and others. The reptiles include the huge python, the crocodile and many poisonous snakes; while among the insects are termites, locusts, the destructive Tsetse fly and butterflies of brilliant hues.

History. Africa is the home of the oldest civilization. Egypt was an ancient nation before the Roman Empire was founded, and extending along the coast of the Mediterranean were various nations from Egypt to Carthage, which, previous to and during a portion of the existence of the Roman Empire, held considerable influence. Undoubtedly the power of these nations prevented the exploration of the continent to the south; hence the Nile valley and a narrow strip along the northern coast were the only portions of the continent that were known to the world for many centuries. During the Middle Ages the influx of Arabs was attended by some exploration of the regions around the upper portions of the Nile and the eastern part of the Sudan, and in the fifteenth century several voyages of discovery were made along the western coast. Finally, in 1485 Bartholomew Diaz, sailing under the auspices of King John of Portugal, discovered and sailed around the Cape of Good Hope. Twelve years later Da Gama, following the same course, sailed around the cape and reached India. But these voyages did not awaken any general interest, though in the latter half of the sixteenth century the Portuguese established colonies on both the eastern and western coasts, where they still hold possessions.

The event which led up to the present interest in Africa was the exploration of the interior by Mungo Park, who made an extended expedition through the Niger country from 1795 to 1797. However, it was a number of years after this before his efforts were seconded by others. In 1840 David Livingstone began his great work of exploration and philanthropy in southern Africa, working northward from Cape Town. Between this date and the time of his death in 1873, Doctor Livingstone explored nearly all of that portion of the continent as far north as the head of Lake Tanganyika. On his death the proprietors of the New York *Herald* and London *Telegraph* combined to send Henry M. Stanley, who had previously visited Livingstone on Lake Tanganyika, to complete the work which the great explorer left unfinished. On this expedition Stanley explored the country around the headwaters of the Nile, then traveled from Victoria Nyanza southward as far as Lake Bangweolo, thence followed the Lower Lualaba until he reached the Atlantic coast, settling the problem as to

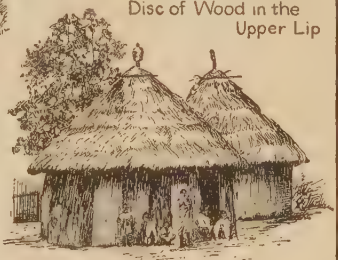
"A Little Lump of Misery"



Native Hut, East Africa

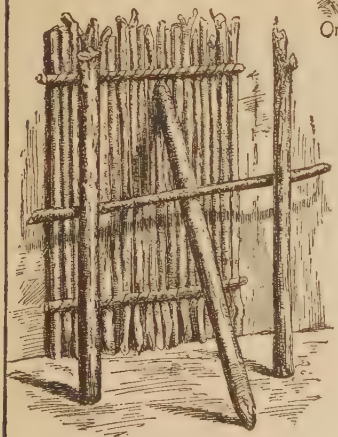
One Method of Trapping Elephants

East African Women Wear a Disc of Wood in the Upper Lip



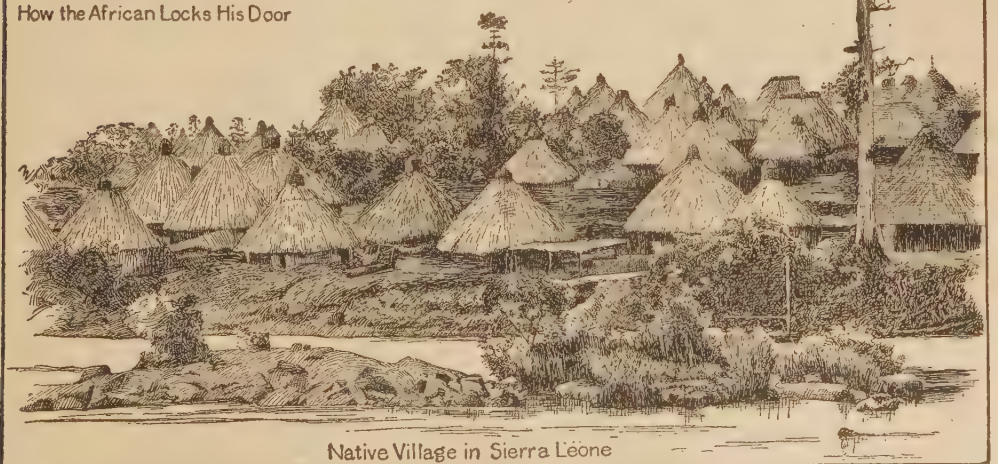
Central African Home

Accurate Types of Young Africa



How the African Locks His Door

Knotted String Calendar



Native Village in Sierra Leone

the extent and direction of the Congo, by proving that this river and the Lualaba were one.

Partitioning of Africa. In 1876 the African International Association was organized, with Leopold II, king of the Belgians, as president. The purpose of this association was to explore systematically the equatorial portion of Africa, beginning upon the eastern coast and working westward. Stanley, having accomplished this feat, was immediately engaged by the association to return to Africa and open up to settlement a large tract of country on the Congo. Stanley's efforts resulted in the establishing of the Congo Free State. The interest which this movement aroused among the nations of Europe led to the convening of the Berlin Congress in 1885, at which all of the leading nations of Europe and the United States were represented. The purpose of this congress was to arrive at a mutual agreement by which, without conflict, the different nations could extend their influence over the portions of Africa still unoccupied or unclaimed by civilized powers. As a result of their deliberations, the continent was divided among them as now shown on the political map. See *Political Divisions*, above.

Under the influence of Great Britain, France and Germany, improvements have been rapidly introduced into the regions under their respective control. The greatest of these enterprises are the Cape-to-Cairo Telegraph and the Cape-to-Cairo Railway.

South African Union. The aggressive attitude of the English settlers led to the Boer War, which lasted from October, 1899, to March, 1902, and resulted in making British colonies of the Orange Free State and the Transvaal Republic. Since the war the tendency of the English colonies toward a closer union resulted in 1910 in the formation of a new federation, which took the name *The Union of South Africa.* The federation includes Cape of Good Hope, Transvaal, Orange Free State and Natal, which are now provinces in the Union. These provinces have a combined area of 473,954 square miles and a population of about 6,000,000, one-fifth of whom are white. The general provisions of the constitution are similar to those of Canada, except that the colonies are not given as much power in local legislation. English and Dutch are the official languages. There are two capitals; the legislative capital is located at Cape Town and the executive is at Pretoria. Right to vote is restricted exclusively to the white population.

Related Articles. The geography, government, history, industries and people of each political division and important island are treated in these volumes in the articles on the respective countries, islands and states. Accompanying these articles are lists of related topics. For more general information see the following titles:

Agulhas, Cape	Kalahari Desert
Bantu	Livingstone, David
Barbary	Negro
Berber	Park, Mungo
Bushmen	Red Sea
Cape of Good Hope	Sahara
Cape-to-Cairo Railway	Sudan
Carthage	Stanley, Henry M.
Ethiopia	World War
Hottentots	Zulus
Kaffirs	

AFRICAN METHODIST EPISCOPAL CHURCH, a branch of the Methodist Episcopal Church, organized in Philadelphia by Richard Allen in 1816, exclusively for the benefit of the colored people. Four years later the African Methodist Episcopal Zion Church was organized. Each of these organizations, while independent of the mother church, is conducted under the same rules and polity as the church from which it sprang. The African Methodist Episcopal Church in the United States had, in 1916, 620,000 members, and the Zion Church had 568,608. See METHODISTS.

AGAMEM'NON, in Greek mythology, king of Mycenae and Argos, brother of Menelaus, and commander of the allied Greeks at the siege of Troy. Returning home after the fall of Troy, he was treacherously assassinated by his wife, Clytemnestra, and her lover, Aegisthus. He was the father of Orestes, Iphigenia and Electra. See TROY.

AG'ARIC, a fungus, of which over a thousand species are known. They are arranged in five classes, according as the color of their spores is white, pink, brown, purple or black. Many of the species are edible, like the common mushroom which grows in fields and pastures. See MUSHROOMS.

AGASSIZ, *ag'ah se,* ALEXANDER (1835–1910), an American naturalist, son of Louis Agassiz, was born in Neuchâtel, Switzerland. He came to the United States in 1849, and was graduated at Harvard in 1855. He served on the California Coast Survey and assisted his father in the museum of zoology at Cambridge, Mass. He was later superintendent of the Calumet and Hecla copper

mines, Lake Superior, and amassed a great fortune, of which he gave liberally to Harvard. After visiting different museums in Europe Agassiz was made curator of the museum in Cambridge, which was founded by his father. He was elected a member of the National Academy of Sciences and other scientific societies, and was recognized as one of the great authorities on marine zoölogy.

AGASSIZ, Lake. See Lake Agassiz.

AGASSIZ, Louis John Rudolph (1807–1873), an eminent naturalist, son of a Swiss Protestant clergyman. He studied at Lausanne, Zürich, Heidelberg and Munich. His attention was first specially directed to the study of fishes by his being called on to describe the Brazilian fishes. As professor of natural history at Neuchâtel he distinguished himself by his discoveries concerning fossil fishes, and his researches led him to propose a new classification, whereby he divided fishes into four classes, distinguished by the characters of the skin. His system has not been generally adopted, but the names of his classes have been used.

LOUIS AGASSIZ

In 1836 Professor Agassiz began the study of glaciers. In 1838 he was induced to settle in America, where he was connected as a teacher first with Harvard University and later with both Cornell University and Harvard. He engaged in various investigations and explorations and published numerous works. In 1865 he made zoölogical excursions and investigations in Brazil, which were productive of most valuable results. Agassiz held views on many important points in science different from those which prevailed among the scientific men of the day, and in particular he opposed the theory of evolution. His most important writings are *Researches on Fossil Fishes, Glacial Systems, Outlines of Comparative Physiology* and *A Journey to Brazil.*

AGASSIZ, Mount, an extinct volcano in Arizona, 10,000 feet in height. There is another peak of the same name in Utah which rises to a height of 13,000 feet.

AGASSIZ ASSOCIATION, an organization which was formed by Harlan H. Ballard in 1875 to promote nature study among young people. It was named in honor of Louis Agassiz, the great scientist. The organization has spread over a large part of the world and has as many as one thousand chapters and from 12,000 to 15,000 members. There are many advantages connected with membership. A correspondence course of free instruction on scientific subjects and natural history is given, and prizes are offered for original research. Headquarters are at Sound Beach, Conn.

AG′ATE, a variety of quartz usually classified as chalcedony. Agates are variegated, the colors being arranged in parallel lines or so as to give the stone a moss-like appearance. They are extremely hard, take a high polish, and are used for making choice marble and for ornaments. Agates are found in many localities, but most of the commercial supply comes from Uruguay and Brazil. They may vary in color from pure white to jet black, but shades of red are the most common.

AGAVE, *a gah′ve,* a genus of plants, popularly known as American aloes. They are generally large, and have a massive tuft of fleshy leaves with a spiny apex. They live for many years—ten to seventy, according to circumstances—before flowering. This long delay gives them the common name of century plant. When the time for flowering approaches, a tall stem springs from the center of the tuft of leaves and grows very rapidly until it reaches a height of fifteen, twenty or even forty feet, and bears, toward the end, a large number of flowers. When the fruit has matured the stem dies to the ground. The best known species is the common American aloe, now extensively grown in the warmer parts of Europe and Asia. The sap, when fermented, yields a beverage resembling cider, called by the Mexicans *pulque.* The leaves are used as fodder; their fibers are formed into thread, cord and ropes; an extract from the leaves is used as a substitute for soap; slices of the withered flower-stem are used as razor-strops.

AGE. In law, *age* is applied to the periods of life when men and women are enabled to do that which before, for want of years and consequently of judgment, they could not legally do. Full age in male or female is twenty-one years; this age is com-

pleted on the day preceding the anniversary of a person's birth.

The term is also used to designate the successive epochs or stages of civilization in history or mythology.

The *Archaeological Ages* or *Periods* are the Stone Age, the Bronze Age and the Iron Age, these names being given in accordance with the materials chiefly employed for weapons and other implements during the particular period. See BRONZE AGE; IRON AGE; STONE AGE.

AGENT, in law, a person employed to act for another, called the *principal*, the relation between them being called *agency*. With reference to the authority conferred upon him, an agent may be *general* or *special*, the latter having authority to act for his principal only in a special business. No particular form of appointment is required, except in a few special cases; for instance, an instrument under seal is necessary to confer authority to do an act in the name of the principal under seal. Such an instrument, and the authority conferred by it, is called *power of attorney*. The agent may bind his principal by acts within the scope of his authority. He is personally liable to third persons on contracts made as the agent, when he does not disclose the principal for whom he is acting, but not otherwise, unless he exceed his authority.

Public agents are not usually themselves liable upon contracts made in their official capacity. The principal is generally liable to third persons for civil offenses committed by the agent when acting within the scope of his agency; but this does not relieve the agent of personal liability himself. As against the principal, an agent is entitled to compensation for his services and reimbursement for the expenses of his agency, and for personal loss or damage in properly transacting the business thereof. As a means of enforcing these rights, the law gives him a lien upon the property of the principal in his hands. See CONTRACT; LIEN.

AGE OF MAN, or **HUMAN PERIOD**, that period in the history of the earth in which man had his origin and development. Representatives of the highest order of mammals, the *primates*, appeared in the Miocene Period (see GEOLOGY), and man himself, the highest of the mammal group, made his appearance at some point of time between that period and the present. The exact time of man's origin has not yet been determined, but there is ground for belief that he existed in the eastern hemisphere as early as the Glacial Period (which see). The recorded history of mankind does not go back much farther than 5000 B. C., but the human race is much older than indicated by this date. The divisions of the prehistoric age are described under the headings BRONZE AGE; IRON AGE; STONE AGE.

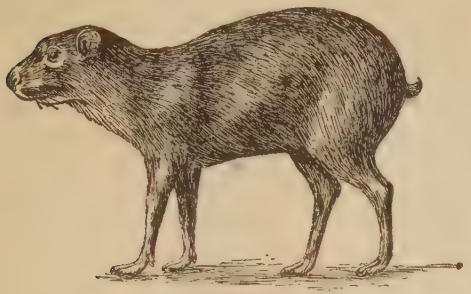
AGINCOURT, or **AZINCOURT**, *ah zhan koor'*, a village of Northern France, in the department Pas de Calais, famous for a battle in 1415, fought during the hundred Years' War. Here Henry V of England, with a force of 15,000 archers, overcame the French, who numbered about 60,000.

AGNOSTICISM, *ag nos'ti sizm*, the doctrine that the existence of a personal God or an unseen world can neither be proved nor disproved. The term is derived from a Greek word meaning *unknowable*. An agnostic is one who says, "I do not *know;* therefore I cannot believe." Those holding this doctrine also maintain that one cannot prove his own existence. Agnosticism is founded on the inability of the human mind to arrive at absolute knowledge and belief and the failure of scientific investigation to discover the first causes for the phenomena of nature. An ancient form of agnosticism is found in the doctrine of a school of philosophers known as the Sophists.

AG'NUS DEI, a term meaning "Lamb of God," applied to Christ in *John* I, 29. In the Catholic liturgy the words are applied to a prayer beginning with "Agnus Dei," generally sung before the communion. The term is also commonly given to a medal, or more frequently a cake of wax, consecrated by the pope and stamped with the figure of a lamb supporting the banner of the cross. These medals are distributed to the faithful the first Sunday after Easter. In the Greek Church, Agnus Dei is a cloth bearing an image of a lamb. It is used to cover the cup in the communion service.

AGOUTI, *a goo'te*, the name of several rodents, forming a family by themselves. There are eight or nine species, all belonging to South America and the West Indies. The common agouti, or yellow-rumped cavy, is of the size of a rabbit. It burrows in the ground or in hollow trees, and lives on vegetables. It grunts like a pig, and is as greedy, so that where it is common it does

much injury to crops. The agouti's flesh is white and palatable.



AGOUTI

AGRA, *ah'gra*, India, capital of a district of the same name, situated 841 miles northwest of Calcutta and 110 miles southeast of Delhi. It has interesting structures, among which are the imperial palace; the Moti Masjid, or Pearl Mosque; the mosque called the Jama Masjid, or Great Mosque, and the Taj Mahal, a world-famous mausoleum of the seventeenth century, built by the Emperor Shah Jehan for his favorite queen (see *Taj Mahal*). Agra has an extensive trade in grain, sugar, tobacco and cotton, and various manufacturers, including inlaid mosaics, for which the inhabitants have acquired a world-wide reputation. The city is one of the oldest in India and has been prominent since the first part of the sixteenth century. During the Sepoy mutiny of 1857 it was a place of refuge for Europeans, after it was captured by the British. Agra is an important railway center and also a commercial and financial center of Northwest India. Population 1911, 185,449.

AGRA'RIAN LAWS, laws enacted in ancient Rome for the division of the public lands. The right to the use of the public land belonged originally only to the ruling class; but subsequently the claims of the plebeians to it were also admitted, though they were often unfairly treated in the sharing of it. Hence arose much discontent among the plebeians, and various remedial laws were passed, though they were not put into execution. See Gracchus.

AGRIC'OLA, Gnaeus Julius (37–93), a Roman statesman and general. As governor of Britain he reduced the greater part of the island to subjection, and although he was the twelfth Roman general who had been in Britain he was the first who in any degree reconciled the Britons to the Roman yoke. He constructed the chain of forts between the Forth and the Clyde, and sailed round the island, discovering the Orkneys. His life, written by Tacitus, his son-in-law, gives a most valuable account of Britain during the early Roman rule.

AGRICULTURE, the oldest and most essential of occupations, and the foundation upon which all others have been reared. Were farming to be discontinued for even a year the civilized portion of the world's peoples would die, and even the easy-living natives of tropical zones would be near to starvation. Thus in a sentence may be summarized the all-important place of agriculture in the lives of the people. The farmer is the one vital factor in the world; even at this day we would survive without iron and steel, gold, silver and copper, as did our remote ancestors, but wheat, corn, oats, rye and barley from the farm we must have that we may live.

Agriculture is at once the most extensive business in the world and one of the leading sciences. It is a business, because so many follow it as a means of livelihood; it is a science, because earnest men are studying, arranging and classifying the facts they have learned about agriculture, and in the light of known things they are reaching out in search of unknown truths, that they may be classified and handed down for the benefit of humanity for all time to come. Science is classified knowledge; so long as men knew only certain isolated facts regarding agriculture, and were ignorant of the relation one truth bore to another, agriculture was not on a scientific basis.

Why the Farm Is Now Attractive. We have heard much in recent years about desertion of the farm by young men and women—that their education has been "away from the farm, to the city and to the factory." Not only has hard labor induced this exodus, but another cause can be as reasonably assigned. The methods employed by the old-time agriculturist have been too slip-shod, his horizon too limited; the esthetic feelings have been

discouraged by reason of drudgery with ancient tools and worn-out ideas. The dawn of a new era is here, bringing with it the application of scientific ideas to every branch of the industry; improved machinery, which multiplies results and saves time and toil and money; and a growing feeling of dignity and position which affects the entire social structure.

From another viewpoint, developed within the memory of those who have not yet reached middle life, the farm presents attractions which reconcile young people to country life. The farmer's family may have the daily paper and the daily mail, delivered free and on schedule time; the telephone may bring at evening the day's closing market reports from the great cities; good roads, lengthening every year, bring the farm appreciably nearer to the town, and the automobile, now considered a rural necessity, almost annihilates the distance. The community center adds a social and intellectual feature and gives to the country almost every advantage enjoyed by the town. To all these add the feeling of the increasing dignity of agriculture, and it is clear why young people, lured for a time from the soil, return again to the homes and occupations of their fathers.

However, there are men and women and young men and young women not yet awake to the new era in agriculture. They do not know that the states of the Union spend very large sums of money annually to learn of the agricultural possibilities of each section of every state, and that all the resulting valuable information is given to the public without cost. They do not know why certain crops so frequently fail, but if they would write to their State Agricultural Experiment Station they might learn the reason. They should wish to know something about rotation of crops on such soil as covers their farms; the information is ready for them, if they apply for it.

Scientific Farming. The application of the principles of physics, chemistry, botany and other branches of physical science to agriculture in a scientific manner is of comparatively recent date, so recent, in fact, that only a small percentage of the acreage under cultivation in the United States is tilled in accordance with scientific methods. The chief requisites in scientific farming are analysis of the soil to determine the crops and fertilizers best adapted to it, selection and testing of seed to secure the greatest yield, operation and care of agricultural machinery, the study of the life history of noxious insects and plant diseases for the purpose of their prevention and extermination, the application of scientific principles to animal husbandry and the keeping of such a system of accounts as will show the expenditures, receipts and net gain or loss of each crop or other enterprise undertaken.

Agriculture in Rural Schools. To encourage scientific agriculture the states of the Union and the provinces of Canada have established agricultural colleges and experiment stations or farms to teach young men and women who are to manage the farms of the future. Not all young farmers find it possible to attend these schools, so in a small way scientific agriculture is being brought to the rural districts. School authorities are introducing on a broader scale each year the study of elementary agriculture and are placing such courses at the command of pupils even in districts remote from high schools.

Work for a School Year. For the purpose of assisting teachers and parents we herewith give an outline of what can be attempted in a year in the average rural school. The work is arranged by months, beginning with September, but the work of any month can be taken up without that of the preceding month, except that the necessary material must be provided. Better results, however, will be secured if the work can be taken regularly through the year in the order in which it is given.

The lessons should be graded and the older pupils given such exercises as will tax their capacity and lead to practical and interesting results. The lessons for the primary and intermediate divisions should be included in the nature study work, which as far as possible should be directed along the lines of agriculture. Practically every rural school now has a prepared course of study in which the nature study work is given, and the lessons as they are outlined should be followed to prevent confusion. If a school garden can be maintained, much can be accomplished in connection with it, and it should be made the most of, assisting both the lessons in nature study and in agriculture.

Too much should not be attempted, especially if the subject is new to the school.

The work with the primary and intermediate divisions should be of such a nature that it is applicable wherever the school is located. That with the grammar divisions should deal chiefly with the agricultural interests that are most prominent in the locality; as corn in the corn belt, wheat in the wheat belt and the prevailing sorts of fruit in a fruit region. One, and at the most two, lessons a week are all that can be devoted to this subject; yet if these lessons are carefully planned much can be accomplished.

The outline which follows is confined to those lines of work especially suited to agriculture, and it is designed for the grammar divisions of the school. The reason for this is readily seen when we understand, as before stated, that the more elementary lessons must in practically all cases be included in the nature study work.

September—This is the month when many plants mature. The study of the seed vessels and seeds of these plants should be taken up during the month. Have the pupils bring to class specimens of all the grains and grasses grown in the neighborhood, such as corn, oats, peas, beans, etc. In the case of the smaller grains, several stalks of each should be brought by each pupil. But one or two stalks of corn with the ears in place will probably answer for the entire class. Pea vines and bean stalks with the pods in position should also form part of the collection.

Have the pupils study the heads of the different grains and note how the seed is arranged upon each.

Notice the different coverings, as the hulls on wheat, husks on corn and pods which enclose the peas and beans.

What grains are threshed?

What does the threshing machine do to them?

Compare heads of the same grain as to fruitfulness by counting the kernels of wheat and oats on different heads. Send the pupils to the corn field to count the number of ears on different stalks. Have them count the number of peas and beans in different pods. In connection with this counting, ask the pupils to compare the ears of the plants and their general appearance of thriftiness. The difference in stalks of corn in regard to these peculiarities is more easily traced than in the wheat and oats and smaller grains, so it is well to begin this exercise with the corn plant.

The remaining lessons of the month should be devoted to the collection and study of seeds. Each pupil should have his own collection arranged in bottles or small boxes which are labeled. These collections should be stored for use in the spring.

October—Numerous insects deposit eggs which form chrysalides which remain through the winter, and upon hatching form the early brood of these insects the next spring. Very effective field work can be done by the pupils by making collections of these egg clusters and chrysalides. If they are found on the twigs of trees or shrubbery, cut off the twig and pin to it a slip of paper bearing the name of the plant from which it is taken. If the egg cluster or chrysalid is taken from any other object, make a record of the place in which it was found. Keep these collections in a cool place through the winter. They will form material for future lessons.

The nature and composition of soil can be studied this month with profit.

November—As the winter approaches, attention should be called to the care and feeding of stock. What constitutes a proper ration for milk cows, horses, swine and other domestic animals will be of sufficient importance to employ the attention of the class during the month. Ask each pupil to give an account of the kind and quantity of fodder used for the different animals of the farm where he lives. This will lead to the discussion of the quality of different kinds of feed and best methods of curing, storage and preparation for the stock.

Are there any silos in the neighborhood?

Of what advantage is the silo?

Why would you feed a dairy cow a ration different from that fed a draft horse?

What are the best feeds for fattening cattle?

For fattening pigs?

The observations necessary to answer these questions should be carried through the winter months and the points brought out as occasion may require.

December—Continue the lessons on live stock. Discuss the construction of stables and other buildings for shelter.

What are the essentials for a sanitary stable?

What defects are common in the construction of stables?

Does it pay to shelter stock in regions where the animals will survive the winter without shelter? Why?

The discussion of these questions will lead the class to give attention to the construction of stables for dairy cows and probably will lead them to notice the good and bad points about the barns and the other outbuildings on the various farms in the neighborhood. The lessons can be made very interesting and profitable if the pupils are led to observe, to glean information from their farmer friends and then to compare notes and discuss in class the results of their efforts.

January—This is a good month in which to study the branching and the bark and wood of trees. For outlines of these studies, see Nature Study. Some birds remain through the winter. Lead the class to discover all the birds they can and learn what they feed upon and where they find shelter.

Are these birds of any benefit to the farmer during the winter? Why?

What can be done to entice the birds to remain about the buildings?

For a plan of the study of birds, see Nature Study. Review from time to time the observations on feeding stock.

February—The older pupils will be interested in a simple but effective system of accounts that enable the farmer to keep a record of each portion of work carried on, as with the different crops, the dairy, the poultry, swine, beef cattle, etc. In keeping these accounts, the crop or other industry should be charged with everything expended for it and credited with everything it returns. To illustrate: in the account with the corn field, the field should be charged with whatever is expended for labor in preparing the ground for the seed, with the fertilizer used and with the seed and seeding. Later it should be charged with the expense of tillage, and when the crop is ripe, with the expense of harvesting and marketing. To these charges should be added the use of the land at a fair valuation and at the rate of interest which that amount of money would receive if loaned.

The field should be credited with the corn produced. This credit will usually be divided into several items, such as seed corn, corn sold and corn retained for use on the farm. If the stalks are used for feed or in any other way that yields an income, either directly or indirectly, this income should also be credited to the field. The balance of the account will show the actual gain or loss on the crop.

Several lessons can very profitably be devoted to these accounts. Lead the pupils to see what should be charged to such accounts as poultry, dairy, beef and pork. Make model forms and prepare exercises for practice, so that the pupils will become accustomed to the form of an account. It will then be an easy matter to keep such accounts with the enterprises carried on on their own farms. Their ability to do this will usually be very gratifying to the parents. Any teacher familiar with the elements of bookkeeping can easily arrange such a system of accounts, and an elementary text on bookkeeping should constitute a part of every teacher's equipment.

Train the pupils to be systematic and regular in keeping these accounts. At the close of each day on the farm, memoranda of the day's business should be entered in the book used for this purpose. These items should be entered in their respective accounts at regular intervals. If the farmer's accounts are to be of value they must be kept as systematically as are those of the merchant. The farmer not accustomed to keeping a system of accounts may at first think it a waste of time. Therefore the teacher must thoroughly impress the importance of this practice upon the pupils. The accounts with the crops should begin with the preparation of the ground for planting and close with the marketing of the crop. Accounts with industries from which a constant return is received can be opened at any time. It is well to balance such accounts every month, and they should never be allowed to run over three months without balancing.

March—This is the month in which preparations for planting are begun in many localities, but in the colder sections of the country these preparations are necessarily deferred until later. Three lines of work demand attention this month:

1. Testing seeds. In addition to the test given in the school, have each pupil prepare a testing apparatus and test the seed to be used on his own farm.

2. The cocoons and eggs collected in the fall will need attention. They should now be brought into the schoolroom and placed in cages to prevent the escape of any insects which may hatch from them. To make the insect cage, take a small box, such as a cigar box, or one of similar size made of cardboard. Cut out a portion of one side and fasten over this space some wire screen. Place in the box one or two supports and place the eggs and cocoons within.

Under natural conditions the eggs and cocoons will hatch at about the time when the leaves upon which the larvae feed appear. They may not hatch for some weeks after placing them in the schoolroom, but they should be cared for in order that none of the specimens may be lost. As soon as the insect hatches, place in the box leaves from the tree or shrub upon which the eggs or cocoons were found.

3. Birds will begin to return and a practical field study of them should begin. Much of this can be done incidentally by pupils on their way to and from school and as other opportunities offer. However, in order that this study may be successful, the teacher should enter into it with the pupils and give specific directions as to what to look for and how to conduct the observations. The important fact to be brought out in this study is the relation of the bird to the farmer. Many birds are of greatest benefit to the farmer in destroying insects, and they should be protected. Too often the farmers consider the birds as enemies, because they eat berries and other fruit; but the insects they destroy far more than repay for these small depredations. Every school library should be provided with books giving descriptions of our common birds and directions for observing them. The following are inexpensive and will be found very useful. They are given in the order of their preference:

Bird Guide. Reed. Doubleday, Page & Co.

Color Key to North American Birds. Chapman and Reed. Doubleday, Page & Co.

Bird Life. Chapman. D. Appleton & Co.

Handbook of Birds of Eastern North America. Chapman. D. Appleton & Co.

How to Know One Hundred Wild Birds of Illinois; How to Know One Hundred Wild Birds of Indiana. Educational Publishing Company.

Bird Homes. Dugmore. Doubleday, Page & Co.

The swelling of buds, coursing of sap and general awakening of vegetation to life will involuntarily attract the attention and arouse the interest of the pupils, and from their observations numerous valuable hints can be derived.

April—The study of the soils, preparation of the seed bed and planting, wherever these activities occur on the farm, should take the time of the regular lessons in agriculture for April. So far as possible obtain specimens of the different kinds of soil in the school district. If these are placed in glass cans, their differences in color and structure can be seen as they appear in mass. Study the soils according to the plan given on page 16. Have the pupils study the methods used in preparing the ground for the crops.

Is the same method used for corn, potatoes, wheat or oats? If not, how do these methods differ?

Try experiments in planting. Fill small boxes or glass fruit jars with soil. In each, plant several kinds of corn, wheat, oats, cucumbers and other seeds. Place some of these seeds one inch below the surface, some two inches and others to a depth of three inches. Which seeds grow the best?

If you can have a school garden, begin working upon it as soon as the weather and condition of the soil will permit. In this and all other work on the garden, strive to put into practice the plans and methods discussed in class. If you do not have a school garden, induce the pupils to plant plots at home. Encourage the care of these through the summer by the promise of a school exhibit of what they raise, at the beginning of the fall term. At this exhibit the products should be judged by the most experienced farmers in the district and first, second and third mention given pupils securing the best results. A contest in raising corn, potatoes or some other crop can be so managed that it will awaken lively interest throughout the district. If the school is in a county which has a school exhibit at the county fair, the exhibits receiving the first and possibly the second mention should be placed in the county exhibit.

Begin the study of insects with those hatching from your collection of eggs and cocoons. As fast as the young insects appear, place them on the leaves of the plant which they feed upon. Make a record of the date upon which the eggs hatch. Then record the date when the larva spins its cocoon or makes its chrysalis.

How long do the insects live in the larva state?

Within a short period the perfect insect will appear from the cocoon. How long did it remain in the pupal state?

Secure specimens of eggs from each kind of insect and note the time required to hatch. At this rate how many broods of these insects will appear during the summer?

Some of these observations may extend beyond the school term, but their completion is profitable work for the summer vacation.

May—Tillage should receive first attention this month, and the experiments begun in April should be continued. Lead the pupils to see that the different crops require different degrees of moisture. Have them investigate the relation of tillage to the conservation of moisture in the soil.

Why should a fine mulch be maintained in the corn field or potato field?

What effect does rolling have upon moisture?

What effect does rolling have upon planting?

What effect upon conserving moisture?

How do you explain this?

The number of plants in a stand should be noted. What number produces the best results?

The garden plots should receive careful attention. Keep the soil loose and free from weeds, that the young plants may get a good start. So far as possible, let the dew and rain supply the moisture, but use the watering pot when necessary.

Project the work for the summer. Many rural schools close in May. We have given several hints as to what should be done during the summer, such as care of the garden, following the life history of insects and continuing the study of birds. In addition to these lines of work, a systematic study of weeds common to the locality should be made. Procure Farmer's Bulletin No. 28, Weeds and How to Kill Them, by writing to the Secretary of Agriculture, Washington, D. C.

Encourage the pupils to study the growth and maturing of the crops.

How many days between planting and harvest?

What was the yield per acre?

Was the crop reasonably profitable?

What insects damage the crops?

Have any plant diseases appeared?

If so, what are they?

Questions like these kept before the pupils during the summer will lead to much careful observation. The results of this observation will constitute valuable material with which to begin the work the second year. See that the school library contains a few books on elementary agriculture. Write the department of agriculture at Washington, D. C., for Circular 94, Revised Edition, Free Publications of the Department of Agriculture, Classified for the Use of Teachers.

General Suggestions. 1. From the beginning have the pupils use note books in which to record their observations. These books should be systematically arranged and neatly kept. The records will be useful for future reference.

2. Place the burden of the work upon the pupils, by asking them to examine objects which you wish to discuss. Tell only what you must, but do not fail to give information beyond the reach of the pupil when it is

necessary. Work with the pupils as their director in research.

3. Have occasional written reviews. These should be given when a subject has been completed. Many excellent and interesting papers can be obtained by the pupils in agricultural topics. The essays on corn on the following pages show what can be accomplished. The preparation of such papers affords excellent exercises in language and also leads the pupils to see the necessity of language study.

United States Statistics. There are in the United States, according to the most recent national census, 6,361,502 farms, containing 878,798,325 acres, of which 478,451,750 acres are improved, the remaining 400,346,575 acres comprising the acreage of woodland and other unimproved land. The land in farms represent 46.2 per cent, or somewhat less than one-half of the total land area of the country. The improved land, which forms more than one-half (54.4 per cent) of the farm land, represents only about one-fourth (25.1 per cent) of the total land area of the country. The average size of a farm is 138.1 acres, of which on the average 75.2 acres are improved and 62.9 acres unimproved.

At the same census the total value of all farm property reached the enormous sum of $40,991,449,000, of which over two-thirds (69.5 per cent) represented the value of land, somewhat less than one-sixth (15.4 per cent) the value of buildings, and about the same proportion (15.1 per cent) the value of the equipment.

Farms in Canada. Vast areas in the Dominion yet await settlers. The Census and Statistics Office has never published the farm acreage of Canada, but it has tabulated the acreage devoted to various crops. In 1916 a total of 15,369,709 acres were in wheat, 10,996,487 in oats, 1,802,996 in barley. Fewer than a million acres each were given to flax, buckwheat and corn.

Value of Farm Land. For the entire Dominion the average value of occupied farm lands in 1919 was as follows:

All Canada	$ 41.00	N. Scotia	$ 33.60
Alberta	22.00	Ontario	52.50
B. Columbia	118.50	P. E. Island	39.00
Manitoba	32.00	Quebec	52.00
New Brunswick	29.40	Saskatchewan	23.00

Related Articles: Consult the following titles for additional information:

CROPS

Alfalfa, Barley, Buckwheat, Clover, Corn, Cotton, Flax, Fruits (with list), Hay, Hemp, Kaffir Corn, Millet, Oats, Rice, Rye, Sugar Cane, Tobacco, Wheat

VEGETABLES

Artichoke, Asparagus, Bean, Beet, Brussels Sprouts, Cabbage, Carrot, Cauliflower, Celery, Chard, Cucumber, Eggplant, Gumbo, Kohl-rabi, Lentil, Lettuce, Onion, Oyster Plant, Parsley, Parsnip, Pea, Potato, Pumpkin, Radish, Rhubarb, Spinach, Squash, Sweet Potato, Tomato, Turnip

LIVE STOCK AND POULTRY

Cattle, Duck, Egg, Fowl, Goat, Goose, Hog, Incubator, Mule, Poultry, Sheep, Turkey

DAIRYING

Butter, Cattle, Cheese, Churn, Creamery, Cream Separator, Dairying, Milk, Milking Machine, Oleomargarine, Silo and Silage

FARM EQUIPMENT

Cotton Gin, Plow, Reaping Machine, Sowing Machine, Thrashing Machine, Traction Engine

SOIL AND TREATMENT OF

Alluvium, Drainage, Dry Farming, Fertilizers, Guano, Irrigation, Manures, Rotation of Crops, Soil

PLANT ENEMIES AND REMEDIES

Blight, Boll Weevil, Brown-tail Moth, Chinch Bug, Codling Moth, Curculio, Ergot, Gypsy Moth, Herbicides, Paris Green, Mildews, Locust, Diseases of Plants, San Jose Scale, Scale Insect, Smuts, Insecticides and Fungicides

ANIMAL DISEASES

Anthrax, Distemper, Foot and Mouth Disease, Gapes, Glanders, Heaves, Lumpy Jaw, Mange, Rinderpest, Sheep Tick, Spavin

EDUCATION

Agricultural College, Agricultural Experiment Stations, Agriculture, Department of, Canning Clubs, Farmers' Institute

UNCLASSIFIED

Gardening, Grafting, Greenhouse, Floriculture, Horticulture, Landscape Gardening

AGRICULTURE, DEPARTMENT OF. As early as 1836 the United States government began to take an interest in the development of agriculture by distributing seeds among

the farmers. In no other way at that time could they procure them. As the country expanded the need of more extensive and better organized effort was recognized, and in 1862 a Bureau of Agriculture was created as a part of the Department of the Interior. The work so developed that the Bureau was made a separate department in 1889, and its secretary became a member of the Cabinet (which see). At that time the department was organized into four bureaus—Plant Industry, Animal Industry, Chemistry and Soils. In 1891 the Weather Bureau was taken from the War Department and made a part of the Agricultural Department (see WEATHER BUREAU).

Other additions were made from time to time, and in 1918 the divisions of the department included, besides those mentioned above, the Forest Service (see FORESTRY), Bureau of Entomology, Bureau of Biological Survey, Bureau of Crop Estimates, Division of Accounts and Disbursements, Division of Publications, Bureau of Markets, States Relation Service and Office of Public Roads and Rural Engineering. The secretary of the department has seven assistant secretaries, and each division is supervised by a chief. The work of the department includes the following lines of investigation:

(1) **Bureau of Animal Industry:** conducts researches on diseases of animals; investigates dairying, animal breeding and animal feeding.

(2) **Bureau of Plant Industry:** conducts researches in plant breeding and the diseases of plants, including forest trees; investigates farm management; conducts demonstration work with farmers in up-to-date farm practice; makes studies of farming under various conditions, such as farming on dry land, in irrigated districts, etc.; collects and tests seeds and plants brought from other countries.

(3) **Bureau of Chemistry:** makes researches in regard to food, drugs, water, feed, insecticides and fungicides, etc.

(4) **Bureau of Soils:** investigates, classifies, surveys and maps out soils; carries on studies in soil chemistry and physics, and in soil fertility; makes researches in the field of natural fertilizers.

(5) **Bureau of Biological Survey:** makes studies of the food habits of animals; maps out life zones; conducts researches on the geographic distribution of plant and animal life.

(6) **Bureau of Entomology:** makes studies of the history and distribution of insects; determines which are beneficial; studies methods of exterminating those that are harmful; promotes bee keeping.

(7) **Office of Public Roads:** collects and gives out information on road management; makes experiments in road making and road improvement; tests road materials.

(8) **States Relations Service:** coöperates with homes and schools in the organization of canning clubs, sending out bulletins, pamphlets and other necessary material.

Canadian Department of Agriculture. The branches of the Canadian department of agriculture correspond in a general way to those of the United States, but the forest service and weather bureau of Canada are connected respectively with the department of the interior and the department of marine and fisheries.

AGRICULTURAL COLLEGE, a college established for the purpose of higher education in agriculture. The first suggestion for an American agricultural college was made by Washington in his first message to Congress in 1790, but it was many years before this suggestion bore fruit. The first agricultural college in England was established in 1845, and the first one in the United States was founded in connection with the University of Michigan in 1857. In 1862, by the passage of what is known as the Morrill Act (see MORRILL, JUSTIN S.), large tracts of government land were granted to the different states for the purpose of maintaining agricultural colleges, and in 1890 each college was granted $15,000 a year additional, with provision that this grant should be increased by $1,000 a year until it reached $25,000. Every state now maintains an agricultural college, and most of them are in connection with state universities. These colleges have not only the income from the original land grant, but an annual Federal Grant of about $50,000 for instruction and $30,000 for experiment stations, besides state appropriations. There are agricultural colleges also in Hawaii, Porto Rico and the Philippine Islands.

Canadian Agricultural Colleges. In each of the Canadian provinces education in agriculture is provided through the provincial university or through a special college of agriculture. Ontario College at Guelph was the first of the agricultural schools to be established, and it has students in attendance from all over the world. The college in Manitoba has home economics courses for women, and some of the institutions offer instruction in teaching. In Canada as well as the United States special short courses lasting two or

three months are given to students who desire instruction without receiving credit.

AGRICULTURAL EXPERIMENT STATIONS, stations for carrying on scientific experiments in the interests of agriculture, horticulture and dairying. The first agricultural experiment station in the United States was established at Wesleyan University, Middletown, Conn., in 1875. In 1887 Congress made an appropriation of $15,000 a year to each state and territory for the purpose of maintaining stations of this sort, and there are now stations in every state and territory, including Alaska, Hawaii, Guam, Porto Rico and the Philippines. They are usually connected with agricultural colleges, and they receive annual appropriations approximating $30,000.

The work of these stations is to experiment with fertilizers and soils; to improve varieties of grain and fruit and breeds of live stock; to study the habits of, and to devise means for destroying, noxious insects, and to study the diseases of domestic animals and provide means for their prevention and cure. Each station emphasizes the line of work that is of greatest importance to the agricultural interests of the state in which it is located. The results of their experiments are made known through bulletins, which are distributed free to the farmers of the state in which the station is located. There are now over 700 agricultural experiment stations in the world. They have been the chief means of introducing scientific methods into agriculture.

Canadian Experiment Farms and Stations. In Canada work along similar lines is carried on by the Central Station at Ottawa, and by nearly a score of branch farms or stations in the provinces. The Central Station is organized into nine divisions; field husbandry, animal husbandry, horticulture, cereals, chemistry, forage plants, botany, poultry and tobacco. This station specializes in the purely scientific phase of agricultural work, and publishes an annual report.

AG'RIMONY, a genus of plants belonging to the rose family, but having small yellow flowers in a large cluster at the ends of the stems. The plant grows on waysides and waste fields, stands two feet tall and bears downy, pinnate leaves. It has an aromatic odor and is bitter to the taste. The dried leaves are sometimes used in brewing a gargle for sore throat.

AGRIP'PA. See HEROD AGRIPPA I; HEROD AGRIPPA II.

AGUAS CALIENTES, *ah gwas kahl yen'taze*, MEXICO, a city which takes its name from the many hot springs in the vicinity. The name means *hot water*. Aguas Calientes is located 300 miles northwest of Mexico City. It is the capital of the Mexican state having the same name, and under normal conditions is a prosperous industrial and railway center. Cotton goods, tobacco and pottery are made here, and silver, copper and lead are mined in the surrounding region. The city is the scene of a great fair every year at Christmas time. Population, 1910, 45,198.

A'GUE. See MALARIA.

AGUINALDO, *ahge nahl'do*, EMILIO (1870–), the leader of the Filipino insurrection against the authority of the United States. It is not known who his parents were. About 1888 he became involved in trouble with the authorities and went to Hongkong, where he came in contact with the British and received considerable information about modern methods of warfare. Returning to the Philippines, he became mayor of Cavité Viejo and was acting in that capacity at the outbreak of the insurrection in 1896. Owing to the prominent part he took in this uprising, Aguinaldo was offered a large sum of money to leave the country. He accepted the terms.

At the outbreak of the Spanish-American war he returned to Manila for the avowed purpose of aiding the United States, but in the next year assumed the offensive against the United States. He directed the rebel forces with considerable ability, maintaining his supremacy by an unusual shrewdness, combined with great firmness of character. After a number of severe engagements, his troops became so hard pressed that they were compelled to flee to the mountains. In March, 1901, Aguinaldo was captured by General Frederick Funston. He was brought to Manila, where he took the oath of allegiance to the United States and issued a proclamation to the Filipinos in which he advised them to lay down their arms and acknowledge the sovereignty of the United States. Later he became a prosperous gentleman farmer near Manila, and gained the entire respect of his former enemies. His son volunteered his services to the allied cause during the World War. See PHILIPPINES, subhead *History*.

AGULHAS, *a goo'lyas,* CAPE, the most southerly point of Africa, about 100 miles east-southeast of the Cape of Good Hope. Its highest point is 405 feet, and on the cape stands a lighthouse whose tower is seventy feet high. The light is seen for over eighteen miles.

A'HAB, the seventh king of Israel. At the instigation of his wife, Jezebel, he erected a temple to Baal and became a cruel persecutor of the true prophets. His history may be found in the last seven chapters of *I Kings.*

AHASUERUS, *a haz u e'rus,* in Scripture history, a king of Persia, probably the same as Xerxes, the monarch of the days of Esther, to whom the Scriptures ascribe a singular deliverance of the Jews from destruction. Ahasuerus is also a Scripture name for Cambyses, the son of Cyrus (*Ezra* IV, 6), and for Astyages, king of the Medes (*Dan.* IX, 1).

A'HAZ, the twelfth king of Judah, succeeded his father Jotham and ruled 736–728 B. C. Forsaking the true religion, he gave himself up to idolatry and plundered the temple to obtain presents for Tiglath-pileser, king of Assyria (*II Kings* XVI).

AHAZI'AH. 1. The son of Ahab and Jezebel, the eighth king of Israel, who died from a fall through a lattice in his palace at Samaria, after reigning from 853 to 852 B. C. (*I Kings* XXII, 51–53). 2. The fifth king of Judah, and nephew of the above. He reigned but one year and was slain (842 B. C.) by Jehu (*II Kings* VIII, 24–29).

AIDA, *ah e'dah,* an Italian opera that has long held the favor of audiences because of its inspiring music and dramatic story. It was composed in 1871 by Verdi, and first presented at the opening of the opera house at Cairo, Egypt. The honor of composing a work to celebrate this opening was conferred on the musician by Ismail Pasha, the khedive of Egypt. The heroine of the opera is Aïda, daughter of an Ethiopian king; the hero, Radamès, is captain of the Egyptian royal guard. The lovers meet a tragic death in a vault beneath the temple, after their refusal to be parted from each other. The rôle of Aïda has been portrayed by many sopranos of high rank, including Melba and Nordica.

AID-DE-CAMP, also pronounced *aid deh kahN'* a staff officer who acts as military and social assistant to a commanding general officer. In time of war the duties of an aid-de-camp are such as to bring him constantly into the danger zone, and the tasks assigned him require not only personal courage but great presence of mind and alertness. On the field of battle he is the bearer of all orders from his superior officer to the other commanding officers. In the United States army a lieutenant-general may have two aids and a military secretary; a major-general may have three aids, and a brigadier-general two.

AINMILLER, *ine'mil ur,* MAX EMANUEL (1807–1870), a German artist who may be regarded as the restorer of the art of glass-painting. As inspector of the state institute of glass-painting at Munich he raised this art to a high degree of perfection by the new or improved processes introduced by him. A series of forty windows in Glasgow Cathedral, containing one hundred historical and scriptural pictures, is his chief work.

AINO, *i'no,* or **AINU**, *i'noo,* the native name of a backward race of people inhabiting the Japanese island of Yezzo, Saghalien and the Kurile Islands, and believed by some to be the aboriginal inhabitants of Japan. They number about 18,000, all but 1,500 of whom live on Yezzo. The Ainos average less than five feet in height, but are strong and active. They are considered among the filthiest people on the globe. Their hair is black and is found on the whole body and most of the face; in complexion they are dark brown, approaching to black. It is said that they always welcome white visitors to their settlements.

AIR, the gaseous substance of which our atmosphere consists. It is a mixture of 79.03 parts nitrogen and 20.97 parts oxygen, with small amounts of other gases and water vapor. The gases exist separately and do not unite to form a compound as oxygen and hydrogen do to form water. The oxygen is necessary to animal life, and it is that portion of the air which serves to purify the blood in respiration. The chief use of the nitrogen appears to be to dilute the oxygen. Water contains air having a larger proportion of oxygen than that found in the land, and fishes which breathe by gills obtain their oxygen from the air in the water. The properties of air are discussed under ATMOSPHERE. See also AIR BRAKE; AIR COMPRESSOR; AIR ENGINE; AIR PUMP; BAROMETER; COMBUSTION; LIQUID AIR; BREATHING.

AIR BRAKE, a device for stopping cars by operating the brakes by compressed air. The invention of this device, by George Westinghouse, has been the means of preventing countless accidents. Under the old system, when each car was equipped with a separate hand brake, a long train could not be brought to a stop until several minutes had elapsed. The signal "Down brakes" is now an order for quick, automatic action.

The principal features of this system are the air pump, installed on the locomotive just in front of the cab; the main reservoir, in which the compressed air is stored; the engineer's valve in the engine cab, by which all the operations of the air brake are controlled; the train pipe, or principal service pipe, which supplies the auxiliary air reservoirs under each car with compressed air; the triple valve, which serves to feed the compressed air into the auxiliary reservoirs and to supply the brake cylinder with air. It is this triple valve which makes the system automatic.

The air, compressed by the air pump, is led through a pipe to the main storage tank. From this air tank, a pipe leads to the engineer's valve in the engine cab, within easy reach of the engine driver. The air generally is compressed to a pressure of 90 pounds to the square inch in the main reservoir. A certain movement of the handle of the engineer's valve opens the ports which permit the air to pass into the train pipe, which runs from the locomotive under each car. This pipe is connected between the cars by a rubber hose, so that it is continuous.

When the engineer wishes to apply the brakes, he throws the handle of the engineer's valve to a certain position. That opens a port which permits the air in the train pipe to escape into the open air. This lowers the pressure in the train pipe, and the balanced valve, responding to the higher pressure in the car reservoir, slides back, and thus opens an aperture which permits the air in the car reservoir to reach the brake cylinder. The pressure of the air forces the piston of the brake cylinder forward, and this piston, through suitable levers, presses the brake shoes against the wheels and the brakes are set.

Within the brake cylinder is a coiled spring. When the engineer desires to release the brakes, he feeds air from the main reservoir on the locomotive into the train pipe, thus increasing the pressure. This forces the balanced valve the other way, and thus opens an aperture which releases the air in the brake cylinder into the open air. The coiled spring, reacting, forces the brake piston back to its normal condition, and thus releases the brakes. See WESTINGHOUSE, GEORGE.

AIR CELLS, small cavities containing air only, found in the stems and leaves of plants. They are largest and most numerous in water plants such as the lily, the leaves of which are buoyed up by their means. The minute cells in the lungs of animals are also called air cells, and there are curious air cells in the bodies of birds. These are connected with the lungs and are situated in the chest cavity and in the abdomen, and sometimes extend even into the bones. They are most fully developed in birds that have strong, powerful flight, such as the albatross. See AIR.

AIR COMPRES'SOR, an air pump for forcing air into a closed vessel. The simplest form is the common bicycle pump. This has a valve in the piston opening downward, and another in the bottom of the cylinder opening outward. When the piston is raised, the cylinder below it is filled with air. When the piston is forced down, the valve in it is closed, the valve in the cylinder is forced open and the air is driven into the vessel. Whatever the size of an air compressor, it operates on this principle.

Very large air compressors, operated by water power, steam engines or electric motors, are often used in mines and tunnels for forcing a circulation of air and for supplying air to operate machine tools. In this case the air acts the same as steam in a steam engine. Some of these compressors are so powerful that they will condense the air until it exerts a pressure of 3,500 pounds to the square inch. The compressed air is stored in a reservoir, from which it is drawn as required. See AIR; COMPRESSED AIR.

AIREDALE, *air'dayl*, one of the largest of the terriers, a wiry haired dog with high tail, deep chest and hanging ears. The Airedale weighs from forty to forty-five pounds and is trimly and powerfully built. It has black crown, sides and back, and tan throat, face and limbs. Airedales are very intelligent, and they are possessed of a keen sense of smell. These qualities make them valuable as scouts and message bearers, and large num-

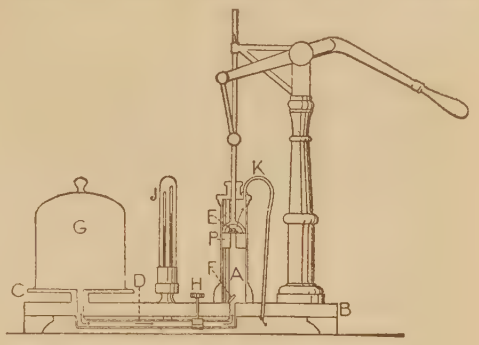
bers were used in this capacity by the French and British during the World War. The feats of these dogs on the battlefield, when they were under fire, were inspired by what seemed almost human intelligence. Airedales were also trained for use in the American army after the United States entered the war.

AIR EN'GINE, an engine in which compressed air, or air heated and, so expanded, is used as the motive power. A great many engines of the former kind have been invented, some of which have been found to work quite well where no great power is required. They may be said to be essentially similar in construction to the steam engine, though of course the expansibility of air by heat is small compared with the expansion that takes place when water is converted into steam. For this reason the cylinders of air engines are much larger than those of steam engines. Engines working by compressed air have been found very useful in mining and tunneling, and the compressed air may be conveyed to its destination by means of pipes. In such cases the waste air serves for ventilation and for reducing the oppressive heat. See AIR COMPRESSOR.

AIR GUN, an instrument for the projection of bullets by means of condensed air, generally either in the form of an ordinary gun, or of a stout walking-stick about the same length. A quantity of air being compressed into the air chamber by means of a condensing syringe, the bullet is put in its place in front of this chamber and is propelled by the expansive force of the compressed air, which is liberated when the trigger is released. The simplest form of air gun is the popgun, made by fitting a wooden piston to the hollow shaft of a goose quill. See AIR; AIR COMPRESSOR; COMPRESSED AIR.

AIR PLANTS, or EPIPHYTES, *ep' i fites,* plants that grow upon other plants or trees, apparently without receiving any nourishment otherwise than from the air. The conditions necessary to the growth of such plants are excessive heat and moisture, and hence they live chiefly in the damp and shady tropical forests of Africa, Asia and America. They are particularly abundant in Java and tropical America.

AIR PUMP, a pump for exhausting air and other gases from a closed space, or for compressing air within an enclosed space (see AIR; AIR COMPRESSOR). The ordinary suction pump for raising water is constructed on the same plan and operates on the same principle as the air pump. In fact, before the water reaches the top of the pipe



AIR PUMP

the air has been exhausted by the pump which pumps the water. An ordinary air pump consists of a cylinder *A*, connected by the tube *D* with a closed vessel with the receiver *G*. Within the cylinder is the piston *P*, on the upper surface of which is the valve *E*, opening upward. At the bottom of the piston is the second valve *F*, which also opens upward. *H* is a screw which opens and closes the connection between the cylinder and the receiver, and *J* is an air-tight tube containing a U-shaped tube, in which there is a quantity of mercury, connected with the receiver *G*. *C* is the plate upon which the receiver rests.

In operating the pump the piston is forced downward and the valve *E* is opened, thus transferring the air from below the piston to the space above it. When the piston is raised, the valve *E* is closed and the air is forced out through the tube *K*. The space below the piston becomes a vacuum and the expansive force of the air in *G* opens the valve *F* and fills the cylinder. With the second stroke of the piston this air is forced through the tube *K*, and so on with each repeated stroke until the air in *G* becomes so rarified that it can no longer operate the valve *F*. The difference in height in the columns of mercury in *J* indicates how perfect a vacuum has been obtained.

Many interesting experiments can be performed with the air pump. A lighted candle placed under the receiver immediately goes out when the air is exhausted, thus showing that air is necessary to combustion. A bell suspended from a silk thread can be heard when the receiver is filled with air, but when

the air is exhausted it cannot be heard. This shows that air is necessary to the propagation of sound. If a glass of water be placed under the receiver, as the air is exhausted bubbles will rise to the surface of the water, showing that it contains air, which, as the pressure above is lessened, expands and rises. A shriveled apple or a prune placed under the receiver becomes plump as the air is exhausted, and a bladder filled with air will be expanded until it bursts, because of the expansive force of the air it contains. The air pump was invented by Otto von Guericke, about 1654.

AIR SHIP. See FLYING MACHINE.

AISNE, *ane,* **RIVER,** a river of Northeastern France, famed as the scene of many struggles of the great war that broke out in Europe in 1914. It rises in the Ardennes Mountains, flows north and then west, and empties into the Oise near Compiegne, after a course of about 180 miles. The Aisne is navigable for over half its length.

Battles of the Aisne. Early in the war, in September, 1914, the Germans, after their repulse at the Marne, established themselves on the opposite side of the Aisne, which flows north of and almost parallel with the Marne. The pursuing allied armies and the Germans fought a desperate battle along the river, without decisive results. Both sides then established themselves in trenches, with the river between them.

In January, 1915, the French began an offensive against the Germans, crossed the Aisne at Soissons, and gained some initial successes. After five days of bitter fighting, however, they were compelled to retreat to their former positions. The Aisne region was again the scene of bloody struggles during the great German drive of 1918. See WORLD WAR.

AIX-LA-CHAPELLE, *ayx lah sha pel',* or **AACHEN,** a city of Rhenish Prussia, forty-four miles southwest of Cologne. The most important building is the cathedral, the oldest portion of which was erected in the time of Charlemagne, as the palace chapel, about 796. This place was the favorite residence of Charlemagne, who died in 814. A gold coffin containing his remains is to be seen in the cathedral at the present time. Thirty-seven German emperors and eleven empresses have been crowned in the city, and the imperial insignia were preserved here till 1795, when they were carried to Vienna. There are a number of warm sulphur springs here, and several mineral springs which have a reputation for curing rheumatism and other diseases. Aix-la-Chapelle is an important commercial center. The chief manufacturers are cloth, gloves, leather, chemicals, linen and paints. Population in 1910, 156,143.

AIX-LA-CHAPELLE, CONGRESS OF, a congress held at Aix-la-Chapelle in 1818, for the purpose of adjusting the affairs of Europe after the wars of Napoleon. The Czar Alexander I of Russia, Emperor Francis I of Austria and King Frederick William III of Prussia were present in person. Among the great statesmen present were Metternich, Castlereagh, Wellington, Hardenberg and Richelieu, the grandson of the great cardinal. The chief thing accomplished was the withdrawal of the foreign troops from France and the recognition of France as one of the great powers of Europe on her agreeing to the Holy Alliance. See NAPOLEON I; FRANCE, subhead *History.*

AIX-LA-CHAPELLE, TREATIES OF. The first was concluded May 2, 1668, between Louis XIV of France and the Triple Alliance, including England, Sweden and Holland. Louis, after the death of Philip IV, laid claim to a large portion of the Spanish Netherlands. He had already seized several fortresses, and Holland in alarm concluded the Triple Alliance. Louis, fearing this strong combination, accepted terms by which France retained possession of the fortresses of Charleroi and Lille and gave back Franche Comté to Spain.

The second treaty was concluded in 1748, at the close of the War of the Austrian Succession (see SUCCESSION WARS). The cause of the war was the dispute of the claim of Maria Theresa to the throne of Austria. All the great powers of Europe were engaged in this war, and by the terms of the treaty the different states held nearly the same possessions as before.

A'JAX, The name of two Grecian chiefs who were prominent in the war against Troy, known respectively as the Greater and the Less. Ajax the Greater was from Salamis, commanded twelve ships in the struggle against Troy and is represented by Homer as the boldest of the Greeks after Achilles. Ajax claimed the arms of Achilles after the latter's death, but they were awarded to Ulysses. Ajax became insane and after kill-

ing all the sheep of the Greeks, which in his delusion he imagined were the followers of his rival, he slew himself. Ajax the Less is remembered chiefly for his brutal treatment of Cassandra after the fall of Troy.

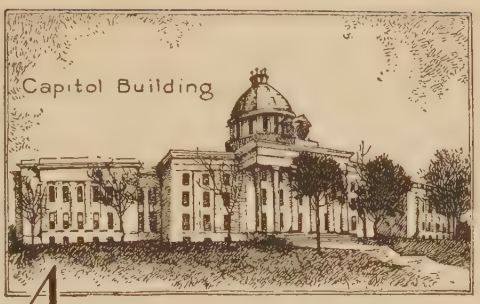
A KEM'PIS, THOMAS. See THOMAS A KEMPIS.

AKKA, *ah'kah,* a pigmy race of black people in the Belgian Congo, whose members average four and one-half feet in height. They live near negro clans of large stature, to whom they look for protection. Their houses are dome-shaped, and are built in circles.

AKRON, O., the county seat of Summit County, fifth in size among the cities of the state, with a population of 69,067 in 1910. This increased to 93,604 in 1917, by Federal estimate. The city enjoys the distinction of being the largest rubber-manufacturing center in the world, particularly famous for automobile tires; twenty factories where these are made employ 30,000 people, and the annual rubber output exceeds $125,000,000. It also is noted for cereal products and great publishing houses. The largest match factory in the world is at Barberton, a suburb.

Akron is thirty-five miles south of Cleveland, 160 miles southeast of Toledo and 136 miles northwest of Pittsburgh. The Pennsylvania, the Erie, the Baltimore & Ohio, the Northern Ohio and the Akron, Canton & Youngstown railroads enter the city. There are eleven parks, the largest being Perkins, seventy-seven acres; Summit Lake, forty-five acres, and Elizabeth, twenty acres. There are two national banks and six state banks.

The city was founded in 1807 and named Akron in 1825, the word being of Greek derivation meaning *height,* for the site is 500 feet above Lake Erie. Incorporation as a city occurred in 1865. The waterworks were purchased by the municipality in 1912, and the town built a sewage disposal plant in 1915. The court house was built in 1907 at a cost of nearly half a million dollars; the postoffice was erected in 1890. The newest public building is the Auditorium-Armory, begun in 1916, and completed at a cost of $150,000. There is a Carnegie Library. Hungarians predominate among the foreign-born population; the people are seventy-five per cent American-born. The fire department is fully motorized.



ALABAMA, in the heart of the South, is popularly known as THE COTTON STATE. Its area is 51,998 square miles, of which 719 square miles are water. It is almost as large as Maine, New Hampshire and Vermont combined, and is about one-fourth as large as France. Among the states it is twenty-eighth in size. The population in 1910 was 2,138,093; there were 41.7 people to the square mile. In 1910 there were 908,282 negroes. Eighty-seven per cent of the people were born within the state. According to Federal estimates for 1917, three cities have more than 25,000 people each; they are Birmingham (189,716), Mobile (59,201) and Montgomery (44,039). The same estimate gave the entire state 2,363,939 inhabitants. Seventeen states had greater populations in 1910.

Surface and Drainage. Spurs of the Appalachian Mountains enter the northeastern part of the state from Georgia, and form low parallel ranges, nowhere exceeding 1,600 feet in altitude. A low range known as the Raccoon Mountains extends northward across the state. In the east-central part the Lookout Mountains terminate abruptly about sixty miles from the boundary. To the southwest of these ranges is a low elevation, the Cumberland Plateau, containing rich deposits of coal and iron ore. The southern portion, including three-fifths of its area, is a part of the Great Coastal Plain, and is all lowland with a deep, fertile soil.

The Tennessee River flows across the northern part, forming a great bend. The valley adds much to the scenery of the region. The Mobile River system drains the greater part of the state. Other important streams are the Tombigbee and its tributary, the Black Warrior, which drain the western part into Mobile Bay, the only important indentation along the coast. This bay forms one of the most spacious and safe harbors of the Gulf

and is an important factor in the commercial life of Mobile.

Climate. The climate varies with altitude and elevation. The northern section has a delightful climate with a mean temperature for January of about 43° and for July about 84°. Even in winter the thermometer seldom falls below freezing point. The elevation tempers the intense heat of summer, and this region is becoming a resort for invalids and others who wish to escape the rigors of a northern winter. In the lowlands and the southern part the heat is more intense, but is tempered by the Gulf breeze. The rainfall in the northern portion averages fifty-four inches, and in the southern portion sixty-three inches.

Agriculture. Alabama is essentially an agricultural state, and "cotton is king." The revenue from cotton and cotton seed exceeds $80,000,000 a year, a greater amount than the combined returns from coal, lumber and cotton manufacture. Besides, in the northern counties the corn crop is worth $45,000,000. Oats, wheat, rice and other cereals are increasing in acreage and add materially to the wealth of the state. Almost 4,000,000 acres have been planted to cotton yearly, but recently farmers have turned in some degree to more diversified crops. Small fruits are given large acreage; the pecan industry is increasing, the crop being worth now about a quarter of a million dollars yearly. The total value of the state's crops is close to $150,000,000 a year.

Alabama's farms have decreased in average size from 290 acres in 1850 to seventy-nine acres, owing to the breaking up of large plantations. The most valuable farm land is in the Tennessee valley and in the Black Belt section, where the average value ranges from $45 to $100 per acre.

The important forest trees in the mountain region are the oak, hickory, chestnut, cedar, elm and pine. In the low plains of the south are forests of cyprus, yellow pine and magnolia.

Mineral Resources. The northeastern portion of the state, extending southward as far as Columbus, Ga., and westward, including the Cumberland Plateau, is rich in minerals. Within this area have been found extensive deposits of iron ore and of bituminous coal. The latter is mined to the extent of over $25,000,000 a year. The city of Birmingham has been made the greatest town in the state by the coal, iron and steel industries which center there. Its annual output of iron is about 2,000,000 tons; in iron ore production Alabama is now exceeded only by Minnesota and Michigan. There are deposits of asbestos, a little asphalt, and considerable quantities of copper, granite, marble and porcelain clays.

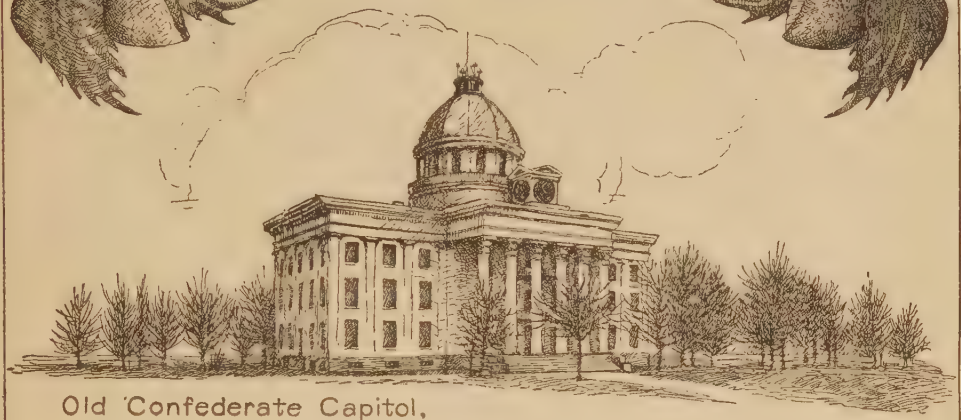
Manufactures. The development of the iron and coal mines has led to the establishment of large manufacturing industries. These consist of smelting works, foundries and coke ovens in the mineral regions, sawmills in the forests, gristmills, leatherdressing establishments, distilleries for the manufacture of turpentine and resin and factories for the manufacture of cotton goods. In recent years the manufacture of iron and steel and their products, and of cotton goods and coal tar products have developed rapidly. Lumber and lumber products exceed even iron and steel in value, which are third on the list of manufactured articles. The manufacture of cotton goods is second.

The quarrying of marble and other building stone gives employment to considerable numbers in certain localities. Fertilizers are manufactured by combining the cotton-seed meal with phosphates which are obtained from mines in Florida. Alabama is advancing rapidly and the conditions for nearly all lines of manufacturing industry are so favorable that it bids fair to take its place in the front rank of the manufacturing states of the Union.

Transportation and Commerce. Alabama leads all other southern states in mileage of navigable rivers. The Alabama, the Tombigbee, the Warrior and the Tennessee are the leading water avenues of commerce. Mobile is the great bay which provides a magnificent harbor. There are over 5,500 miles of railways, or one mile to each nine and a half square miles of land surface. All of the great steam roads of the South enter the state.

Government. By the constitution, the right of suffrage is restricted to those who can read and write and interpret any clause of the United States Constitution in English, and who have for the greater portion of the year preceding registration been engaged in some lawful occupation, provided they own, either directly or through their wives, a certain amount of property upon which taxes have been paid. The legislature meets every

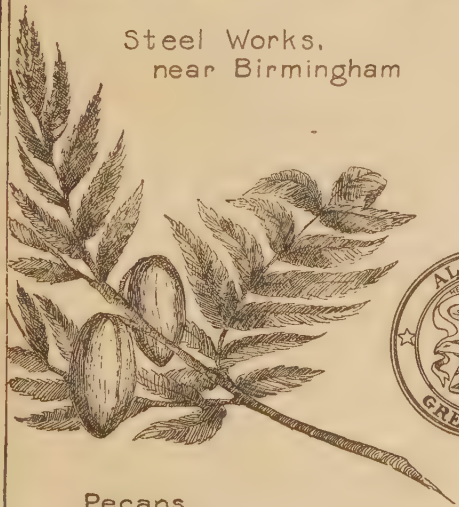
ALABAMA
THE COTTON STATE



Old Confederate Capitol,
Now Main Building of State Capitol

Steel Works,
near Birmingham

Former
Residence of Jefferson Davis
at Montgomery



Pecans

Goldenrod,
State Flower

fourth year, and consists of a senate and house of representatives. The senate cannot exceed in number one-third of the members of the house, and members of both houses are elected for four years.

The executive department consists of a governor, lieutenant-governor, attorney-general, state auditor, secretary of state, state treasurer, superintendent of education and commissioner of agriculture and industries. Each of these officers is elected for four years at the time of the election of members of the legislature. None is eligible for reëlection, and the governor is not eligible by election or appointment to any office in the state or the United States during his term of office, or within one year after the expiration of his term. The judicial power is vested in the supreme court, circuit courts, chancery and probate courts, and such others as may be established by law. The senate may sit as a high court of justice for the impeachment of any state officer. Local government is by counties and townships.

Education. A good system of public schools, requiring separate schools for white and colored children, is maintained throughout the state. In 1916 a constitutional amendment was adopted which provided for a local three-mill tax for added support of the public school system. The state maintains an excellent system of county high schools and several normal schools located, respectively, at Florence, Jacksonville, Troy, Livingston, Daphne, Moundsville, Montgomery, Normal and Tuskegee, the last three being for colored students. There is an industrial school of high grade for white girls at Montevallo; several secondary agricultural schools, a number of universities and several colleges for women. Among the prominent institutions are the University of Alabama, at Tuscaloosa; Birmingham College at Birmingham; Howard College at Birmingham; Alabama Presbyterian College at Anniston; Alabama Polytechnic Institute at Auburn; the Womans' College at Montgomery, and the Tuskegee Normal and Industrial Institute. See TUSKEGEE NORMAL AND INDUSTRIAL INSTITUTE; also ALABAMA, UNIVERSITY OF.

Institutions. The hospitals for the insane are at Tuscaloosa (white) and Mount Vernon (colored). The school for negro deaf mutes and for the blind, and the Alabama Academy for the Blind are at Talladega. The penitentiary is at Wetumpka and the Alabama Industrial School for Boys is at East Lake. There are several branch prisons, with farms and cotton mills, where male and female offenders may work out their sentences.

Reform Movements. The entire state became prohibition territory on July 1, 1915, after a severe struggle which continued for a number of years. By an amendment to the state constitution in 1916 all bank depositors are put on the same basis in case of bank failures. The legislature, in both branches, denied the people of the state in 1915 the opportunity to vote on woman suffrage.

Cities. There are eight cities in the state having over 10,000 people, by a Federal estimate of 1917. These are Birmingham, 189,716; Mobile, 59,201; Montgomery (the capital), 44,039; Bessemer, 17,156; Selma, 15,945; Gadsden, 15,301; Anniston, 14,326; Tuscaloosa, 10,824. Each is described in these volumes.

History. Alabama was visited by De Soto in 1541, but was not then colonized, and was a part of the British Carolina grant of 1663. The French established a settlement at Mobile Bay in 1702 and founded the present city of Mobile in 1711. Thereafter, it was the capital of Louisiana until the territory was transferred to England, when this region became a part of West Florida. After 1783 there was a serious boundary dispute with Spain and it was not definitely settled until 1819, when all of Florida was ceded to the United States. Alabama became a territory of the United States in 1817 and was admitted to statehood two years later. It was decidedly pro-slavery, an earnest advocate of the Mexican War and was one of the first of the Southern states to secede (January 18, 1861). Its capital, Montgomery, became the capital of the Confederate States. During the carpetbag régime, the state suffered serious losses through reckless speculation and fraud. During that period the state debt was increased from $8,000,000 to more than $25,000,000, most of the added $17,000,000 being used extravagantly. In 1874 the Democrats came into control of all departments of the government, and thorough reforms were instituted. A new constitution was adopted during the next year. The state has had five constitutions; the present one went into effect in 1901.

Items of Interest Regarding Alabama

Except in some of the undrained marshes and lowlands along the rivers the climate is healthful; the average temperature ranges from 60° in the north to 67° in the south, and the annual rainfall varies from fifty-four to sixty-three inches.

The prevailing winds are from the south.

Snow falls occasionally in January and February, but almost never in the southern part of the state.

As regards soil, Alabama may be divided into four parts: first, the outer belt of the Coastal Plain, also called the "Timber Belt," extending from the Gulf northward for 150 miles, with poor, sandy soil, which responds well to fertilization; second, the inner belt of the Coastal Plain, generally called the "Cotton Belt," with black soil, rich in limestone and marl; third, the mineral region, with surface of varying fertility, the best coming from granites, sandstones and limestones; fourth, the "Cereal Belt," including the Tennessee Valley, whose richest soils are red clays and dark loams.

The crops of oats, wheat and hay are each valued at approximately $15,000,000 a year.

In the production of peaches, melons, strawberries, sweet potatoes and sugar cane, Alabama takes high rank.

The chief feature of Alabama's industrial life since the Civil War has been the development of its iron and coal resources, so that the state now ranks third as a producer of iron ores, and first as a producer of brown hematite.

Coal was first discovered in 1834; by 1840 the production was 946 tons; to-day it is more than 15,000,000 tons a year, placing Alabama fifth in value and sixth in amount among the states of the Union.

Gold, silver, lead, copper and tin have been found, but not in sufficient quantity for commercial development. The marble, graphite and bauxite deposits are becoming of great commercial value.

The capital invested in manufacturing industries has risen from $10,000,000 in 1880 to $175,000,000, and the value of the products has increased almost proportionately.

Alabama ranks second in the manufacture of coke, which is manufactured chiefly for use in the iron and steel industry.

The annual output of sawed timber is worth about $15,000,000 of which eighty per cent is in yellow pine.

Alabama ranks third in turpentine and rosin products.

In the last twenty years the number of cotton mills has multiplied four times and the output more than five times.

Large sums of money have been spent by the United States government in order to improve the waterways and the harbor of Mobile, the only seaport in the state; the navigable mileage of rivers is now 2,000 miles.

The principal railways are the Mobile & Ohio, the Southern, the Louisville & Nashville, the Frisco System, the Seaboard Air Line, Atlantic Coast Line, and Central of Georgia.

The percentage of illiterates declined from fifty-one per cent in 1880 to twenty-two per cent in 1910.

Questions

What is the area of Alabama? Use Alabama (approximately 50,000 square miles) as a unit of area for the measurement of other states and of foreign countries.

What per cent of the total population is negro?

Describe briefly the physical divisions of the state.

Name the principal rivers.

What kinds of soils are found in Alabama?

What are the four main divisions of the state as regards soil?

How does Alabama rank in the production of turpentine and rosin products?

How many miles of railway are there in the state? Name four of the important railways.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

Alabama (river)
Anniston
Appalachian Mountains
Bessemer
Birmingham
Chattahoochee
Coastal Plain
Coosa River
Cumberland Mountains
Florence
Gadsden
Mexico, Gulf of
Mobile
Montgomery
Piedmont Region
Selma
Talladega
Tennessee River
Tombigbee
Tuscaloosa

HISTORY

Carpetbaggers
De Soto, Fernando
Fort Mims, Massacre of
Reconstruction

ALABAMA, a river of Alabama, formed by the junction of the Coosa and the Tallapoosa, a few miles above Montgomery. After a course of about 300 miles, it joins the Tombigbee and assumes the name of the Mobile. It is navigable throughout most of its course, and is used locally for transporting cotton and grain.

ALABAMA, THE, a famous Confederate raiding vessel, built at Birkenhead, England, in 1862. At Terceira, one of the Azores, the ship received guns, stores and coal from another vessel. Captain Semmes then assumed command, and on August 24, 1862, named the vessel the *Alabama* and hoisted the Confederate flag. Before September 16 it had destroyed Federal ships and provisions valued at more than its own cost, and for nearly two years afterward was the terror of Union merchantmen in every sea. In all, the *Alabama* captured sixty-five vessels and destroyed property estimated at $4,000,000. Swift-sailing cruisers scoured the seas in search of the raider, and it was at length forced to take refuge in the port of Cherbourg, on the coast of Normandy, June 11, 1864. A few days later, the United States steamer *Kearsarge,* commanded by Captain Winslow, also arrived at Cherbourg. June 19 a fight took place outside the port, and in less than an hour the *Alabama* was sunk. Semmes and others were picked up by an English yacht.

Alabama Claims. Not many months after the *Alabama* had commenced its destructive career, Mr. Seward, Secretary of State, informed the British government that the United States would claim damages for injuries done to American commerce by vessels fitted out in British ports. At length Great Britian was induced to submit to arbitration the question of its responsibility in regard to the escape of the *Alabama.* A congress met at Geneva, December 17, 1871, consisting of representatives of Great Britain and the United States, and of three members appointed one each by the king of Italy, the president of the Swiss Confederation and the emperor of Brazil. The decision, given September 15, 1872, was adverse to Great Britain, which was ordered to pay to the United States the sum of $16,145,833.

ALABAMA, UNIVERSITY OF, a non-sectarian, coeducational institution established at Tuscaloosa in 1831. It has more than eighty-five professors and instructors and about 900 students. Its library contains 32,000 bound volumes; the grounds and buildings are valued at more than $1,257,300, and its endowment fund at about $695,800. Its income is about $163,300 a year. Schools of medicine and of pharmacy connected with the university are located at Mobile.

AL'ABASTER, a name applied to a granular variety of gypsum. It was much used by the ancients for the manufacture of ointment and perfume boxes, vases and the like. It is usually of a pure white color and is so soft that it can be scratched with the thumb nail. It is found in many parts of Europe, in great abundance and of peculiarly excellent quality in Tuscany. From the finer and more compact kinds, vases, clock-stands, statuettes and other ornamental articles are made, and from inferior kinds the cement known as plaster of Paris.

ALABASTER VESSELS

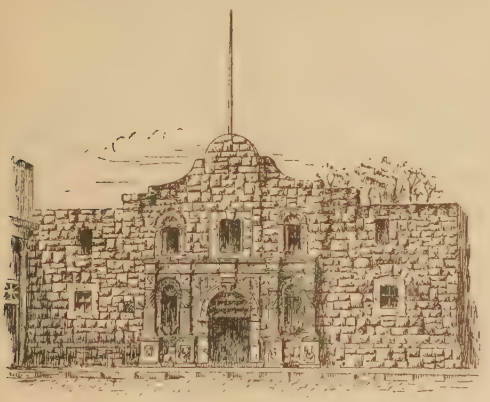
A variety of carbonate of lime, closely resembling alabaster in appearance, used for similar purposes under the name of *Oriental alabaster,* is found in caves in the form of stalactites or stalagmites. It is distinguished from true alabaster by being too hard to be scratched with the nail.

ALADD'IN, the hero of one of the tales in the *Arabian Nights.* He gains possession of a wonderful lamp, which when rubbed, calls to his aid a powerful genius who is obliged to fulfill all of Aladdin's requests. Among the wonderful things which Aladdin orders the slave of the lamp to do for him is to build a palace for his bride. This is done in a single night but later when the princess is left alone in the house she is deceived by a

magician, who gains control of the lamp and compels the slave of the lamp to carry off the palace to Africa. Another mighty genius, however, which is compelled to serve Aladdin on account of his possession of a wonderful ring, brings back the palace and regains for Aladdin the possession of the lamp.

ALAMEDA, *al a ma'dah*, CAL., one of San Francisco's most delightful suburbs, six miles east of the city, across San Francisco Bay. Oakland is directly north. It has the service of the Santa Fe, the Southern Pacific and the Western Pacific railroads. There are five parks, numerous public playgrounds and municipal baths. The city has a Carnegie Library. Industrially the town is active; there are shipyards, a packers' association, flying machine and motor factories. Alameda was given a city government in 1885, and has been governed on the commission plan since 1914. Population, 1910, 23,383; in 1916, 27,732 (Federal estimate).

ALAMO, *ah'lah mo*, an old Catholic mission located at San Antonio, Texas, celebrated for the battle that occurred there during the war for Texan independence, in 1836. The mission was a stone structure surrounded



THE ALAMO

by a strong wall over two and a half feet thick and eight feet high. Within this enclosure about 180 Texans and Americans under Colonel Travis were besieged by the Mexicans under Santa Anna. Among the company were James Bowie, David Crockett and J. B. Bonham, all prominent Texan pioneers. The attack was made so suddenly that the troops had little time to procure supplies of food or ammunition, but, notwithstanding their limited means and the superior numbers of the Mexicans, they resisted the siege for eleven days.

Then Santa Anna, having received large reënforcements and heavy artillery, assailed the mission early on the morning of March 5, and overcoming the gallant resistance, in which nearly all of the inmates were killed, captured the place. Regardless of the laws of war, the Mexicans murdered the few Texans remaining and spared only a colored boy, two women and a baby. The affair incensed the Texans to the utmost, and for the remainder of their struggle with Mexico "Remember the Alamo" was their battle cry. The fierceness of this conflict and the peculiar circumstances attending it have given the Alamo the name of the "Thermopylae of America." The mission has been purchased by the state, and restored as nearly as possible to its original appearance.

ALAND, ISLANDS, *ol'land*, a group of islands and rocky islets situated in the Baltic Sea, at the entrance of the Gulf of Bothnia. The archipelago consists of one large island, Aland, and about 300 smaller ones, about ninety being inhabited. Their total area is 550 square miles, and they are inhabited by sailors, seal hunters and fishermen, chiefly of Swedish ancestry. The islands were taken from Sweden by Russia in 1809, and remained in Russian hands until 1918, when they were occupied by Germany. The Germans were forced to evacuate them after their defeat in the war. Their fate was left in the hands of the peace conference. It was decided to destroy the fortifications which Russia had erected on the islands after the outbreak of the World War.

AL'ARIC I (?–410), a famous chieftain of the Visigoths, who twice invaded Italy and besieged Rome three times. He was naturally generous, and it was owing to him that the splendid buildings of Greece and Rome suffered so little damage during his invasions. The most lasting effect of his inroads on the Western Empire was the establishment of the Visigothic Empire in Spain by the warriors whom he left behind him.

ALARIC II, eighth king of the Visigoths, who succeeded his father, Euric, in 485. He preferred peace to war, but, because he was an Arian and rejected the doctrine of the Trinity, he was obliged to contend with Clovis, who undertook the defense of orthodox Catholicism. The army of Alaric was defeated, and he was slain (507).

Arctic Circle Schoolhouse

ALAS'KA, the largest of the territorial possessions of the United States, separated from the home states by the Dominion of Canada and reached only by ocean routes. Its most southern town, on the southeastern long arm of land which shuts northern British Columbia from the sea, is Ketchikan. By water Sitka, the former capital, is 400 miles farther north. The distance from Sitka to Seattle, Washington, is 1,130 miles. Juneau, the present capital, is 160 miles northeast of Sitka, and it is also in the same narrow arm of the territory. One must travel nearly 500 miles beyond Juneau to reach the main land area of Alaska.

The compact section of the territory is about 800 miles in width from east to west and about the same in length from north to south. The entire territory is a great peninsula, surrounded by the Arctic Ocean, Bering Sea and the Pacific Ocean, but the term *Alaska Peninsula* is reserved for the long, narrow strip of land jutting into the sea from the southwestern mainland. This peninsula terminates in the Aleutian Islands. The area of Alaska is 590,884 square miles; it is larger than the combined New England States and every state that is touched by the Atlantic Ocean and the Gulf of Mexico, excluding Texas. The population in 1910 was 64,356; in 1917 it was estimated at 64,912, of whom one-third were natives.

The northernmost point (Point Barrow) is 1,200 miles from the North Pole; the most easterly is geographically 700 miles west of San Francisco; the meridian of Honolulu runs through the center of the Aleutian Islands, and the most westerly island of that group is directly north of New Zealand.

Surface and Drainage. The mountains and rivers divide Alaska into four districts:

1. *The Coast District,* extending along the coast from British Columbia to the beginning of Alaska Peninsula and inland to the coast range of the Alaskan Mountains. It has a width varying from thirty to seventy-five miles and includes a number of adjacent islands. This district is famous for its glaciers, which fill the heads of many of the narrow inlets. Those around the head of Lynn Canal and Glacier Bay are best known. The principal rivers of this region are the Copper, with its tributary, the Chichitna, and the Matanuska, Knit and Suchitna, all flowing into Cook's Inlet. The Suchitna is navigable for about 110 miles, and its tributary, the Yetna, for about 100 miles. The coast district is bounded on the north by the principal range of the Alaskan Mountains, which form a watershed between it and the Kuskokwim and Tanana rivers. This is the highest mountain range in North America; it culminates in Mount McKinley, which has an altitude of 20,464 feet.

2. *The Alaskan and Aleutian District.* This projection is formed by a continuation of the mountains in a southwestward direction. The chain of islands, about 150 in number, is a series of mountain peaks projecting above the sea and reaching almost to the Asiatic coast. All are extinct volcanoes, and some have an altitude of 8,000 feet.

3. *The Kuskokwim District.* This includes the basin of the Kuskokwim River and contains a large area suitable for settlement.

4. *The Yukon District.* This embraces all of the territory from the southern watershed of the Yukon basin to the Arctic Ocean. In the eastern portion it is mountainous, but to the north and west it consists of a low, gradually sloping plain. The Yukon receives two important tributaries, the Tanana from the south and the Porcupine from the north.

Climate. Each topographical district differs from the others in climate and soil. The coast district is protected from the winds from the north by the high mountain barrier that forms its inland boundary. It is also subject to the influence of the warm Pacific or Japan Current. For these reasons it has a much warmer climate than those portions of the eastern coast of the continent having the same latitude. The northern third of Alaska has an Arctic climate; below those latitudes the influence of winds and ocean currents is felt. At Sitka 0° has seldom been recorded; the temperature there varies from 3° to 54° in February, the coldest month, and from 35° to 90° in August, the warmest month. In Central Alaska the temperature falls during the long winter nights to —55°; in the short, hot summer months it reaches 90°. Rainfall varies from 130 inches a year at Fort Tongass, where the moist Pacific winds carry moisture over the coast, to eighty-five inches at Juneau.

Minerals. A considerable portion of the interior has not been developed to the slightest degree, yet from present mining operations there are very large returns. In 1917 the total mineral production of the territory was more than $50,000,000.

Gold. Although the presence of gold along the beds of the rivers was known to the Russians, no prospecting occurred during their occupation of the country, as it was against the policy of the government. In 1870 at the head of Cook's Inlet and in other places the sand and gravel on the beach are found to contain gold in paying quantities.

But the most remarkable development has been in the Yukon district, where gold was discovered in 1897. This discovery led to the prospecting of the entire valleys of the Yukon and its tributaries, and valuable deposits were found, both along the river beds and among the mountains, but they are not so rich as those of the Klondike region, in

Americans began prospecting and soon discovered placers and veins of varying richness. The most important of these was on Douglas Island, where a mining camp was soon opened and work on the placers was begun. Soon after, rich veins of quartz ore were discovered. Permanent works for operating the mines were erected and the town of Juneau was established. These mines have been operated with profit ever since, and many other paying mines have been opened in their vicinity. On Baranof Island, near Sitka, around the head of Lynn Canal, around other islands and on the mainland, Canada. Following these discoveries was that on the north shore of Norton Sound, where the sands of the beach and along neighboring streams have proved extraordinarily rich. From 1899 to 1909 the output of gold increased from $825,000 a year to $3,000,000; since that time it has advanced to over $17,000,000 a year. The greatest quantity is mined in the region around Fairbanks.

Coal. Large coal fields are within ninety miles of the nearest good ocean harbor at Cordova. This Bering field contains about fifty square miles, and yields both anthra-

cite and bituminous coal. The largest field contains about seventy-five square miles. It is north of Prince William Sound, 150 miles from tidewater, and consists of low grade lignite and bituminous coal. Before mining can reach a profitable basis railroads must be constructed. Most of the coal used in Alaska is imported from the United States and Canada, but hundreds of millions of tons lie in the territory, ready for the miner.

Other Minerals. Rich deposits of copper have been discovered in the Copper River country and on Prince of Wales Island, and silver ore occurs in a number of localities where gold is found. There are also petroleum beds, and on Prince of Wales Island valuable marble quarries have been opened since 1910.

Vegetation. The islands and mainland of the Coast district are covered with dense forests of evergreen trees, which extend up the mountains to the snow line. In these forests are found thousands of square miles of white pine, cedar, fir and Alaska spruce, all of which are valuable for lumber. West of Cross Sound and in the Kuskokwim valley the growth of trees is lighter, but the mountains and hills at the head of this valley are quite heavily timbered. The valley of the Yukon contains but few trees, but during summer sustains an abundant growth of grass and other herbage. Along the Copper River are also large areas which produce luxuriant growths of grass. The tundras north of the Yukon contain little but Arctic vegetation.

Animal Life. The animals of Alaska are numerous. Commercially, a number of them are important on account of the value of their furs. These are the mink, Alaskan fox (white and blue fox), red and black foxes, the marten and the fur seal. The seal fisheries are located on and around the Pribilof Islands and are under the control of the United States Government, and by Act of Congress in 1912, the killing of seal in United States waters was prohibited until January 1, 1918. Pelagic, or open-sea, sealing is forbidden by treaty between Great Britain, Japan, Russia and the United States. The herd on the Pribilof Islands now numbers about 300,000 seals. The common seal and the walrus are hunted by the natives, who make use of all parts of these animals for food, clothing and other domestic purposes (see SEAL; FUR SEAL).

The importation of reindeer has been a notable economic factor during recent years. This work has been in charge of the United States Bureau of Education. In 1918 there were nearly 85,000 reindeer in Alaska, in seventy-nine herds. The largest herds are in the valley of the Kuskokwim River. The reindeer serve as beasts of burden, their flesh is food, and their skins are used for clothing. (See REINDEER.)

Fox farming is an increasing industry, amounting in recent years to about a quarter of a million dollars annually.

Fisheries. The coast waters and rivers abound in fish. As yet only the salmon fisheries have been developed, and their output averages about $20,000,000 annually. The headquarters of the industry are at Kadiak Island. The cod, halibut and herring fishing grounds are more extensive than those of the Atlantic coast. The United States Bureau of Fisheries is constantly restocking the salmon streams.

Agriculture. For many years Alaska was considered a frozen waste, roaming ground for wild, thick-furred animals. Today as far north as Fairbanks strawberries and all garden vegetables are grown; the short, hot summers have proved to be long enough to mature many crops. The line which marks the northern limit of cereals extends across the territory from a little north of Eagle City to Saint Michaels. South of this, wheat, oats, rye and barley ripen, and the soil is of such fertility that it yields good crops. The abundance of wild grass assures a good hay crop, and live stock can be kept through the winter without difficulty.

The Alaska Agricultural Experiment Station is developing tillage to an extent that is encouraging, although there are probably not over 50,000 square miles of land suitable for farming. The growing season extends from June to September.

Transportation. There were 4,000 miles of wagon roads, sled roads and trails in Alaska in 1918; Congressional appropriations are constantly extending these. The most important development in Alaska in recent years is the building of 1,000 miles of railroad by the United States government, authorized by Congress in 1914. The act provided that the routes were to be determined by the President, that operation should be by the government or on leases for periods not exceeding ten years, and that $40,000,-

000, estimated cost, should be met by bond issues, which should be paid off by sales of Alaska public lands.

THE NEW RAILROAD
Built and owned by the United States government.

The work of building was well advanced in 1918. In May, 1917, 112 miles of the new road were in operation. The main line of the government road will extend from Seward to Fairbanks. Excepting this road, there are 446 miles of privately-owned railroads in Alaska, only 175 miles of which are operated.

So industriously has the government applied itself to the task of building trails that mail, even in the winter, reaches Point Barrow, on the Arctic Ocean.

Alaska's great rivers are a most important means of transportation, and have opened up much of the interior. Though the mouth of the Yukon is only open to navigation two months each year and the Kuskokwim for three months, both streams are clear of ice for nearly four months in mid-year and commerce on them is heavy. The Yukon and the Kuskokwim together provide nearly 5,000 miles of waterway into the interior. Besides these, the Copper and the Kobuk are navigable in their lower sections.

Mention must also be made of the means of transportation provided by the famous Eskimo dog teams; these have been for many years and will long remain the chief means of sledding over Alaska's dreary wastes.

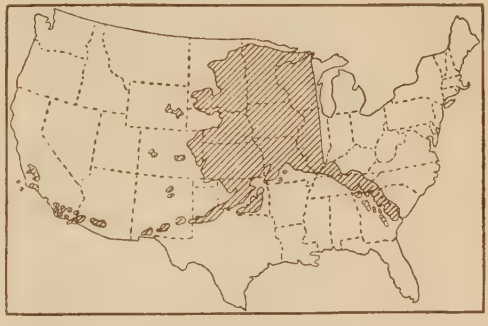
Centers of Population. There are as yet no cities in Alaska having 5,000 population. The incorporated towns with population over 500 in 1910, including Sitka, unincorporated, are given below:

Fairbanks	3,541	Skagway	872
Nome	2,600	Valdez	810
Douglas	1,722	Wrangel	743
Juneau	1,644	Petersburg	585
Ketchikan	1,613	Sitka	539
Cordova	1,152	Seward	534

Education. In incorporated towns a percentage of license fees are applied to public school use; for unincorporated towns the national government makes partial provision, yet here, too, a portion of the license fees are diverted to schools. Native school children to the number of over 4,000 are under charge of the United States Bureau of Education.

Government. The executive power is vested in the governor, who is appointed by the President for a term of four years, by and with the advice and consent of the senate. The governor may veto any bill passed by the Territorial legislature within three days after it is presented to him. The bill must be vetoed within three days if the legislature continues in session; otherwise it becomes a law without the governor's approval. The legislature may override the veto by a two-thirds vote of all members to which each house is entitled.

The legislative power is vested in a Territorial legislature consisting of a senate and a house of representatives. The senate consists of eight members, two from each of the four judicial divisions into which Alaska is



COMPARATIVE AREAS
Maps drawn to the same scale show the surprising extent of Alaska's domain.

divided. The house of representatives consists of sixteen members, four from each of the four judicial divisions. The term of each member of the senate is four years, one member from each judicial division being elected every two years. The term of each member

of the house of representatives is two years.

The legislature convenes biennially at Juneau, the capital, on the first Monday in March in odd years, and the length of the session is limited to sixty days, but the governor is empowered to call a special session, which shall not continue longer than fifteen days. Elections for members of the legislature are held every two years on the first Tuesday after the first Monday in November of each even year.

The judicial power of the Territory is vested in the United States District Court for Alaska and in probate, juvenile, and justices' courts. The district court is divided into four divisions, each presided over by a judge appointed by the President, by and with the advice and consent of the Senate, for a term of four years. It has the same jurisdiction as district courts of the United States, and in addition either appellate or original jurisdiction in all criminal actions and civil causes when the amount in controversy does not exceed $50, arising under the acts of Congress locally applicable to the territory and the acts passed by the Territorial legislature. The probate, juvenile, and justices' courts are located in convenient precincts designated in each judicial division by the United States judges. They are presided over by United States commissioners, who are appointed by the United States judges, and who act as United States commissioners, judges of the probate and juvenile courts and ex officio justices of the peace. These courts have limited original jurisdiction in probate and minor civil and criminal matters arising under the Federal statutes applicable to the Territory and its Territorial laws.

Natives. The native inhabitants include three races: the Eskimos, who occupy the country north of the Yukon; the Athabaskan Indians, who inhabit the mountainous regions in the eastern portion of the valley of the Yukon and southward as far as Cook's Inlet, and the Aleuts, who occupy the Aleutian Islands. In 1910 the native population numbered 25,331; half of these were Eskimos.

History. The peninsula and islands of Alaska were first explored by a Dane, Vitus Bering, in the employ of Russia, in 1740. The first settlement was made on Kadiak Island in 1784, and fifteen years later, with the organization of the Russian-American Fur Company, a vigorous trade and missionary policy was adopted in the region; but the inhospitable climate led to serious financial losses, and Russia ceded the territory to the United States in 1867 for $7,200,000. In 1900 it became a judicial and civil district under the control of Congress. On August 24, 1912, Alaska was organized as a territory by act of Congress, and the legislature met for its first session in March, 1913. Two important international controversies have arisen in conection with Alaska within recent years; one, the control of the seal fisheries, the other, the boundary between Canada and Alaska. The former was based upon the claim of the United States that Bering Sea was a closed sea, subject to the control of Russia and the United States, and that unlicensed fishermen should not kill seals, even outside the three-mile boundary. The claim was referred to a commission, which decided against this contention, but also favored such restrictions on the killing of seals as would save the industry. The boundary controversy arose over the interpretation of a treaty between Russia and Great Britain, which specified that the boundary should follow the windings of the coast and should be fixed ten marine leagues inland. Was the line to be ten leagues inland from the coast of the outer islands, or from the coast of the mainland? The question was of little importance until the discovery of gold in the so-called Klondike region in this disputed territory. After several attempts to adjust the difficulty by negotiation, the question was referred to a commission consisting of three representatives of the United States and three of Great Britain. The decision was rendered in October 1903, and was substantially in favor of the American claim. By the decision part of the gold fields recently discovered are in Canadian territory and part in American territory, but the vast Pacific coast line is wholly within the control of the United States.

Related Articles. Consult the following titles for additional information:

Admiralty Island	McKinley, Mount
Aleutian Islands	Muir Glacier
Bering Sea	Nome
Eskimo	Pribilof Islands
Juneau	Sitka
Kadiak	Unalaska
Kuskokwim River	Yukon River

ALASKA-YUKON-PACIFIC EXPOSITION, held in Seattle, Wash., from June 1 to October 16, 1909. The exposition grounds, which were on a narrow peninsula between Lake Washington and Lake Union,

included 250 acres. In general the buildings were in the French Renaissance style of architecture. The main buildings were grouped on both sides of a beautiful terraced court, at the head of which stood the United States Government Building. The lower end of the court, which was left open, afforded a magnificent view of snow-capped Mount Rainier. Seven of the buildings became the property of the University of Washington after the close of the exposition. The total attendance was 3,740,561 and the total expenses exceeded $10,000,000. The exposition closed with every debt paid.

ALBANIA, *al ba′ ni a*, a kingdom of uncertain status, called into existence by the conference of ambassadors in London in 1913 as a result of the Balkan wars. Previously it had belonged to Turkey, and had comprised the Turkish provinces of Scutari and Yanina. The area is 11,317 square miles; the population, between 800,000 and 1,000,000.

Political considerations prompted the organization of the kingdom. Austria and Italy demanded it; Serbia insisted upon an outlet to the sea, which Austria was unwilling to concede. The boundaries as finally fixed placed Albania along the Adriatic seacoast, making Serbia an inland country, and deprived both Austria and Italy of political advantage.

Prince William of Wied, nephew of "Carmen Sylva," late queen of Rumania, was called to the Albanian throne in March, 1914, but he abdicated in six months because of violent disturbances occasioned by the World War. A Turkish prince, Essed Pasha, then attempted to form a government, but was unsuccessful. In 1915 the Austro-Hungarian army captured the greater part of the country. Its ultimate fate awaits the outcome of the World War. The capital city is Durazzo.

ALBANY, GA., the county seat of Dougherty County, was settled in 1836, and named for Albany, New York. Its railroads are the Central of Georgia, the Atlantic Coast Line, the Seaboard Air Line, the Georgia, Southwestern & Gulf and the Gulf and Georgia Northern. The city is 188 miles south of Atlantic and 210 miles southwest of Savannah. It is in the heart of the cotton country, and has cotton compresses, cotton oil mills, fertilizer factories and lumber mills. Albany is called *The Artesian City,* because of its abundance of artesian water; Blue Spring flows 70,000 gallons per minute. It has the only municipal abattoir in Georgia. Population, 1910, 8,190; in 1917, 10,979 (Federal estimate).

ALBANY, N. Y., the capital of the state since 1797, is situated on the Hudson River, 145 miles north of New York City and 165 miles west and slightly north of Boston. The New York Central, the Boston & Albany, the Boston & Maine, the Delaware & Hudson and the West Shore railroads furnish transportation; added to this there is fine river transportation, the Hudson River being navigable for large steamers from the ocean. The city extends over four miles along the river front, from which the land rises gradually to a height of 200 feet within the city limits. The population in 1910 was 100,253; in 1915, 107,979 (state census).

Boulevards and Parks. The city possesses eighteen public parks; Washington, the largest, has a lake covering six acres, and Beaver Park has a fine driveway through the sunken bed of a former stream. Besides the parks, there are nearly 100 miles of boulevards connecting the park system. On the water front there has been constructed a large concrete recreation pier, with walks, a driveway, boat landings and refreshment booths.

Buildings. The most conspicuous public building is the great state capitol, one of the most magnificant granite structures in the United States, built at a cost of $25,000,000. Another architecturally perfect building is that of the state department of education, which stands opposite the capitol. In addition to being the home of the state department of education it contains the state library of 450,000 volumes, and it shelters the administrative offices of the University of the State of New York. The Federal building is worthy of note, there is a court house which cost a million dollars, a city hall and a state armory. The old state hall will hereafter be the home of the court of appeals; it has undergone extensive remodelling. Other houses of note are the union railroad station and the Ten Eyck hotel; among the buildings owned by the municipality or which are of a public nature are a new high school, that of the Albany Institute and Historical Society and the Homeopathic hospital.

Albany is unexcelled by other cities of its size in the number and beauty of its churches. The Roman Catholic cathedral

seats 2,500 people. The First Reformed Church was organized in 1642, the First Presbyterian in 1763. Saint Peter's Church building is one of the oldest in the United States.

Education. The law, medical and pharmacy departments of Union University of Schenectady are here. Among other schools of importance are an academy for girls conducted by the Convent of the Sacred Heart, Albany Academy for Boys, Saint Agnes School (Episcopal), Albany Institute and Historical Art Society. There are a dozen libraries, containing over half a million volumes.

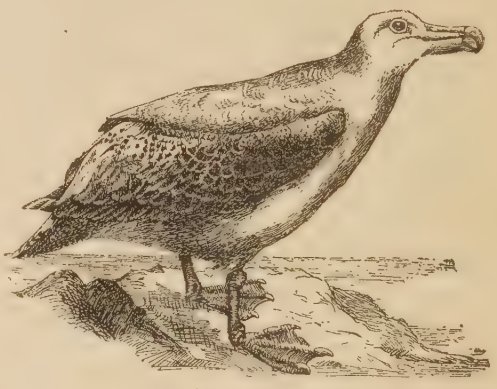
The leading manufactures include shirts, collars and cuffs, stoves, electrical appliances, structural iron, pianos, chemicals, cigars, paper goods, carriages, wagons, flour, boots and shoes and various other articles. Large railroad construction and repair shops, printing establishments, packing houses and breweries are also located here.

Early History. The city claims to be the second oldest permanent settlement within the limits of the original thirteen states, a trading station having been established on Castle Island in 1614, under the name of Fort Nassau. The first real settlement was made in 1624, and the name was changed to Fort Orange. When New Netherlands was transferred to the English in 1664, the present name of Albany was given the settlement, in honor of the Duke of York and Albany, afterwards King James II. It was chartered as a city in 1686. The Erie Canal, completed in 1825, started the town towards a prosperous future.

ALBANY CONVENTION, a meeting held at Albany in 1754, noteworthy as formulating the first plan of union suggested to the American colonies. It was attended by delegates from Massachusetts, Connecticut, New Hampshire, Rhode Island, Pennsylvania, Maryland and New York, and by representative Indian warriors of the Six Nations. The object of this convention was to devise a scheme of union for the colonies, whereby they might give effective aid to England in the forthcoming struggle with France. The plan proposed, which was worked out by Benjamin Franklin, provided for a Grand Council to be made up of representatives elected by the colonial legislatures every three years. A president-general, with veto power over the acts of the Grand Council, was to be appointed by the Crown. The council was to have supervision over Indian matters, and be empowered to levy taxes, enlist and pay troops, and to construct forts. This scheme was rejected by the king because it gave the colonies too much power, and was rejected by the colonies because it gave the king too much power. Nevertheless, the work of the convention was a definite step toward colonial union and ultimate independence.

ALBANY REGENCY. See VAN BUREN, MARTIN.

AL'BATROSS, a large web-footed sea bird of which there are a number of species. The bill of the albatross is straight and strong, the upper mandible hooked at the point and the lower one cut off squarely. In

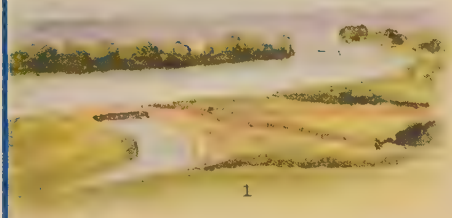


THE ALBATROSS

color its upper parts are grayish-white and the belly white. It is the largest sea bird known, some measuring seventeen and a half feet from tip to tip of their expanded wings.

The albatrosses are found at the Cape of Good Hope and in other parts of the southern seas, where they have been known to follow ships for whole days without ever resting. They are met at great distances from the land, where they settle down on the waves at night to sleep. Whenever food is abundant the birds gorge themselves to such a degree that they can neither fly nor swim. Their food consists of small marine animals, carrion, fish spawn, etc. Only one large egg is laid, and that is placed in a rude nest made by scraping the earth into a ridge. The young are entirely white and covered with beautiful woolly down. Sailors regard the albatross with superstition and think that to kill one brings bad luck. Coleridge used this

ALBERTA



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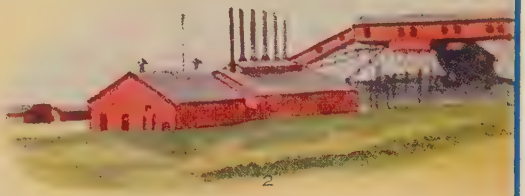

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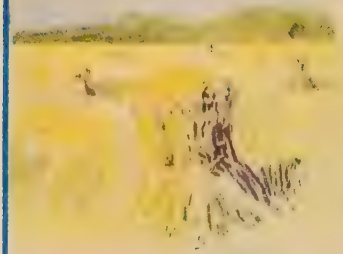

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1, Irrigation Canal at Calgary
2, Colliery
3, Sugar Beets
4, Meat-Packing Plant
5, Oat Field
6, Moose
7, Grain Elevator and Flour Mill
8, Buffaloes in the Park at Banff

belief as the foundation of his poem, *The Ancient Mariner.*

AL'BEMARLE SOUND is situated in the northeastern part of North Carolina, and extends from the mouths of the Chowan and the Roanoke rivers north to the Atlantic coast, from which it is separated by a long island. Its length is about fifty-five miles, and its width from four to fifteen miles. The water is shallow and is nearly fresh.

AL'BERT, FRANCIS AUGUSTUS CHARLES EMMANUEL (1819–1861), Prince of Saxe-Coburg-Gotha, see VICTORIA (Queen of England).

ALBERT I (1875–), king of Belgium, one of the great heroic and tragic figures of the World War. He is the son of Philip, Prince of Saxe-Coburg-Gotha and Count of Flanders, and was born April 8, 1875. Albert succeeded his uncle, Leopold II, who died December 17, 1909, without leaving male issue. Under the Salic Law (which see) the three daughters of Leopold were excluded from the succession, and the crown passed to Albert. Albert's private and public life is above reproach. He married, on October 2, 1900, the Princess Elizabeth of Bavaria, and has three children, two boys and a girl. King Albert made a special study of social sciences and economics, and long before his accession was known as a liberal in politics. He traveled extensively, visited the United States in 1898, and later studied conditions in the Belgian Congo at first hand. He recommended better treatment for the natives, and on his accession announced that the Belgian government must administer Congo affairs humanely.

Albert further proved himself an able and energetic ruler in 1914, on the outbreak of the great World War. He personally took the field in command of the Belgian army, resisted every step of the German advance, led the defense of Antwerp, and shortly before Antwerp's fall withdrew the remnant of his forces to join the British and the French. Although repeatedly urged to yield the active management of the campaign to others, he continued to expose himself to all the hardships and dangers which were faced by his soldiers, and his triumphal entry into Antwerp, in November, 1918, was a most impressive spectacle. King Albert is a second cousin of King George V of England and also of former Emperor William II of Germany.

The old home and the new

ALBERTA, one of the western provinces of the Dominion of Canada and a veritable inland empire, since it is nearly 50,000 square miles larger than either Germany or France, and twice as large as England, Scotland Wales and Ireland, combined.

It extends from the United States - Canadian boundary line (49°) north to 60°, a distance of 750 miles—as long as a line from Philadelphia to Saint Louis. From east to west in its northern half the 110th and 120th degrees of longitude define its boundary, but the western line southward becomes uneven when it strikes the main divide of the Rocky Mountains. It follows the latter to the international boundary. The area of the province is 255,285 square miles; the population in 1901 was only 73,000, but in 1911 had increased to 374,663. A provincial census for 1916 showed a total of 496,525 people. Vast regions in Alberta are yet unsettled, for the number of people is only about two to the square mile. Texas, with about the same area, has fifteen to the square mile, while Belgium, to note the sharpest contrast, had 653 in each square mile in 1914. About 100,000 of the people of the province are emigrants from the United States.

Physical Character. In the lower section of Alberta the elevation, at the Saskatchewan boundary, is about 2,500 feet. Calgary is 3,437 feet above sea level; Banff, 4,534 feet. Mount Stephen, near where the Canadian Pacific Railway crosses into British Columbia, has an elevation of 5,326 feet. The highest point in the province is Mount Columbia, a few miles from the western boundary and about 200 miles southwest of Edmonton.

The Rocky Mountains slope gradually away to the east, and beyond their foothills all of Alberta is a part of the great central plain of North America.

Climate. Because of its great extent from north to south, considerable diversity of climate is experienced. There is lacking the severity of winter that might be expected for such high latitudes. The northern third

experiences severe winters; the central third is no colder in winter than is Southern Minnesota, while the southern third has almost as favorable winters as Northern Illinois, or an average of 12° to 16°. In this southern section are Banff, Calgary and Medicine Hat. The average winter temperature at Edmonton is about 10°. To be sure, a good deal of below zero weather is experienced, but it is not of long duration.

There is not a large amount of rainfall in the southern part of the province, because of the mountain barrier at the west. Irrigation supplies the lack of moisture in many southern sections. Farther north there is more rain. Snow is scarcer than in the North Central United States, and in the southern third of the province it seldom remains all winter.

Drainage. The Mackenzie River system, primarily the Peace and Athabaska rivers, drain the northern half of the province. The Saskatchewan flows eastward through the south central part, and the Milk River drains the southern section.

Animal Life. In the north the fur hunter pursues his occupation as did the hunters and trappers of generations ago. Otter, beaver, mink, ermine and marten, though not as numerous as formerly in some localities, still are fairly plentiful. To preserve the species the laws of the Dominion make it illegal to shoot or trap some of these animals during certain years.

The plains were once the home of great herds of buffalo, but now the only specimens in Canada are in government reservations at Buffalo Park and Elk Island Park. In these reservations also are moose, elk, antelope and deer. In the mountain section red deer, antelope, elk and mountain sheep abound.

Mineral Wealth. Alberta's most valuable deposit is coal (see map, with article COAL). The average yearly output is worth about $16,000,000. There is a large southern area of high-grade coal, and much larger fields containing coal of lower grade. Altogether there are over 16,500 square miles of coal fields—an area more than twice as large as the state of Massachusetts.

Natural gas is abundant in many sections, and where it is found oil also is nearly always to be obtained. Surveys have not yet determined the extent of possible oil production. The mining of gold has decreased in importance.

Agriculture. At one time it was supposed that extensive areas in Southern Saskatchewan and Alberta were too arid for farming and would never be useful except as cattle ranches. Some of these lands have proved to be well adapted to farming even without irrigation, but extensive tracts have been brought under cultivation as a result of irrigation works constructed by the Canadian Pacific Railway Company and other companies. The irrigated land has proved to be as fertile as other sections of the prairie, and prosperous farms have taken the place of cattle ranches.

Over 65,000,000 bushels of spring wheat and more than 1,250,000 bushels of fall wheat were produced in Alberta's banner year of 1915. More than 100,000,000 bushels of oats, 10,000,000 bushels of barley, 1,300,000 bushels of flax, 4,800,000 bushels of potatoes and 335,000 tons of hay indicate the productiveness of a land where there are only two people to each square mile. The total agricultural production is worth nearly a quarter of a billion dollars a year.

Irrigation. There are at least 400 irrigation projects, great and small, in Alberta. The largest and most important is that of the Canadian Pacific Railway, which has made fruitful over 3,000,000 acres along its right of way between Medicine Hat and Calgary. Water for this project is taken from the Bow River. Another important project is that at Lethbridge, also belonging to the Canadian Pacific.

Transportation. Before 1885 there was no rail communication with the outside world. In that year the Canadian Pacific was completed, as part of a compact between British Columbia and the Dominion, and it crossed Alberta. Since then two other great transcontinental lines, the Canadian Northern and the Grand Trunk Pacific, cross the province. Many connecting lines serve as feeders to these. In all there are 2,500 miles of railroad in Alberta.

Cities. Calgary is the largest city, with 56,302 inhabitants, but Edmonton is nearly as large, having 53,794 people (both according to provincial census of 1916). Other towns of major importance are Lethbridge (9,437) and Medicine Hat (9,269). There are a number of towns of considerable local prominence with fewer than 5,000 people. The most famous of these is Banff, with a glorious setting of mountain scenery.

BANFF AND BOW RIVER VALLEY, ALBERTA, CANADA

Items of Interest on Alberta

In the eastern and southern parts its surface is almost treeless, but the soil yields good crops, especially when irrigated; the central part of the province, where the ordinary rainfall suffices, is the most fertile.

In winter the snowfall is very light in the southern part and even this is frequently removed by the warm "Chinook" winds from the west, so that cattle may graze in the open practically the whole year.

The Rocky Mountains ascend by a very gradual slope from the east; the principal peaks are Alberta, 13,500 feet; Athabasca, 13,700; Assiniboine, 11,830; Columbia, about 14,000; Murchison, 13,500.

There are four well-known Alberta passes over the mountains: (1) Crow's Nest Pass, near the southern boundary, through which a branch of the Canadian Pacific runs; (2) Kicking Horse Pass, through which the main line of the Canadian Pacific runs; (3) Yellow Head Pass, running west from the northern branch of the Saskatchewan River, and discovered in 1858; (4) Peace River Pass, through which Sir Alexander Mackenzie made his celebrated trip to the Pacific.

The chief industries are farming and ranching; of cattle the principal breeds are Shorthorn and Herefords, but Holsteins, Ayrshires and Jerseys are being introduced for dairying.

The government maintains ten small-fruit experiment stations in Alberta.

Approximately $100,000 worth of fish are taken from Alberta lakes each year; whitefish represents one-half of the total.

Rocky Mountain Park has an area of 4,500 square miles; in 1911 this park was included in a new Rocky Mountain Forest Reserve with a total area of 18,564.5 square miles.

About 130 collieries are in operation and over 4,000,000 tons of coal, one-fourth of the total for the country, are produced annually.

A rich oil well was struck in October, 1913, at a point about 30 miles southwest of Calgary. The oil is of exceptionally high grade, and is used in its unrefined state for the running of automobiles. At numerous other points wells were opened in a short time, and the production of petroleum is becoming a great industry.

Slaughtering and meat-packing represent one-fifth of the total manufactures; flour and grist-mill products are second in importance.

There are over 700 post offices in Alberta.

The province has an excellent public-school system, a normal school at Calgary, and collegiate institutes for secondary education at Calgary and Edmonton and high schools in all parts of the province. The provincial University of Alberta, situated at Strathcona (Edmonton South) offers full courses in arts and engineering, and a university is also being established in Calgary by private benefactions.

There are twenty-six Indian schools, with a total attendance of 900.

From the time of the incorporation of the Hudson's Bay Company (1670) till 1875 the district was a part of Rupert's Land.

Questions on Alberta

When was Alberta organized as a province? How had it been governed previously?

What is the area of the province?

How many Nova Scotias can be carved from Alberta?

What can you say of the surface and soil?

Name four great peaks of the Rockies, also four well-known passes.

What two great river systems have their source in the province?

What large lake lies on the boundary between Alberta and Saskatchewan?

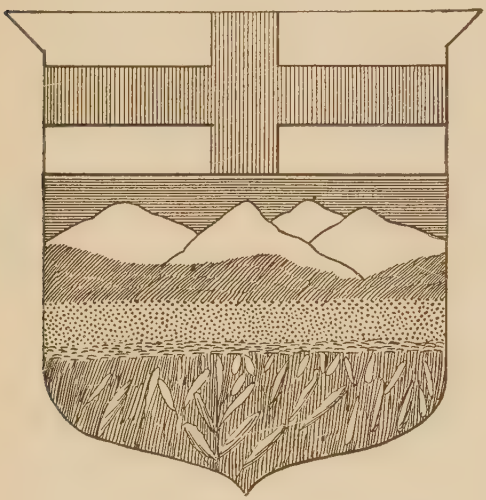
What is the character of the climate?

Where are the large forests found?

What is the area of the Rocky Mountains Forest Reserve?

What great irrigation projects are in operation?

Government. The government of Alberta was organized in 1905. The chief executive is the lieutenant-governor; he is the representative of the Governor-General of Canada, and indirectly of the crown. His appointment is by the Governor-General in Council, for a term of five years, and his salary is



COAT OF ARMS OF ALBERTA.

Above is the cross of St. George, red on a white field, the emblem of union with England. Below is a comprehensive picture of the province. First, the wheat fields, then a stretch of prairie land, then the foot-hills, the Rocky Mountains. Over the whole land is the bright blue sky.

$9,000 per year. An executive council of eight members, headed by the Premier, is responsible for the direct administration of affairs. Legislation is in the hands of an assembly of fifty-six members. Laws passed by them are not effective until approved by the Governor-General.

Alberta is represented in the Dominion, Parliament by four Senators and twelve members of the House of Commons.

History. The name Alberta was first applied in 1882 to a district of the Northwest Territory. Growth of the prairie section after the advent of railroads led to the organization of the provinces of Alberta and Saskatchewan in 1905. The old Alberta district was what is now almost all the southern half of the province. To the east of the old district a narrow north-and-south strip was taken from old Saskatchewan and Assiniboia, and the north half of the present province was formerly a part of Athabaska.

In 1909 the government purchased all the provincial telephone lines, and in the same year the Grand Trunk Pacific Railroad was completed between Winnipeg and Edmonton. On June 30, 1916, prohibition of the liquor traffic became effective, and no liquor can now be sold except for necessities and under strict government regulation.

Related Articles. Consult the following titles for additional information:
Athabasca
Banff
Calgary
Edmonton
Medicine Hat
Saskatchewan

ALBERT EDWARD NYANZA, *ni an'zah,* a lake on the boundary line between Belgian Congo and Uganda, Africa. It was discovered by Stanley in 1876 and named in 1889 for the Prince of Wales, later King Edward VII. The lake is one of the sources of the Nile and is connected with Albert Nyanza by the Semliki River.

ALBERT NYANZA, a lake of east central Africa one of the headwaters of the Nile. It is about 100 miles long and twenty miles wide. It abounds with fish and its shores are infested with crocodiles and hippopotami. This lake receives the Victoria Nile from the Victoria Nyanza and the White Nile issues from its northern extremity.

ALBIGENSES, *al bi jen'seez,* so called from the district Albigeois, where they first appeared, was a religious sect which sprang up in the south of France during the thirteenth century. The Albigenses having professed a belief in doctrines at variance with the Church of Rome, Pope Innocent III preached a crusade against them. They persisted, however, in their heresy and slew the papal legate, Pierre de Castelnau. War began in 1209. After many thousands had perished on both sides, a peace was concluded in 1229. Toulouse lapsed to the crown of France, and thus that country acquired the Mediterranean coast.

ALBI'NOS, a name given to human beings or any other animals from whose skin, hair and eyes the dark coloring matter is absent. The skin of albinos, therefore, no matter to what race they belong, is of a uniform pale, milky color. Their hair is white, the iris of their eyes is pale rose color and the pupils intensely red. The absence of the dark pigment allows the multitude of blood vessels in these parts of the eye to be seen. Albinism is often noticed in the flowers of plants.

ALBU'MEN or **ALBUMIN,** chemical compound, so named from the Latin term for the white of an egg, which is one of its most

abundant known forms. It may be taken as the type of the protein compounds or the nitrogenous class of food stuffs. It is a compound of carbon, hydrogen, nitrogen and oxygen, with a little sulphur. It abounds in the serum of the blood and the vitreous and crystalline humors of the eye. Another variety of albumen exists in most vegetable juices and many seeds, and has nearly the same composition and properties as egg albumen. When albumen coagulates in any fluid it readily encloses any substances that may be suspended in the fluid. Hence it is used to clarify syrupy liquors. In cookery white of eggs is employed for clarifying, but in large operations like sugar-refining the serum of blood is used. From its being coagulable by various salts, an especially by corrosive sublimate, with which it forms an insoluble compound, white of egg is a convenient antidote in cases of poisoning by that substance. With lime it forms a cement to mend broken ware.

In botany the name *albumen* is given to the food supply which surrounds the embryo in the seed, the term in this case having no reference to chemical composition. Albumen constitutes the meat of the cocoanut, the flour or meal of cereals, the horny part of the coffee bean and the bony-like substance in vegetable ivory.

ALBUQUERQUE, *ahl bu ker' ke,* N. M., the county seat of Bernalillo County and the metropolis of the state. Transportation is provided by the Santa Fe and the Santa Fe & New Mexico Central railroads. The city is sixty miles southwest of Santa Fe. As it is 5,000 feet above sea level it is a famed health resort for tubercular patients. There are large lumber interests, also railroad shops, a woolen mill and the usual smaller manufactories. Albuquerque is the seat of New Mexico University and of a government school for Indians. The Harvey Indian Museum, named for Fred Harvey of railroad dining-room fame, is the world's finest collection of Indian baskets and blankets.

A mission was established here in 1658 and the building still stands. The Spaniards settled the place in 1706, but the present town dates from 1880. It became a city in 1892. Population, 1910, 11,020; in 1916, 14,025 (Federal estimate).

ALBUR'NUM, the soft white substance which is found in trees between the inner bark and the wood, and, in progress of time acquiring solidity, becomes itself the wood. Alburnum is another name for sapwood.

ALCESTIS, *alses'tis,* in Greek mythology, the wife of Admetus, king of Thessaly. In accordance with an oracle, her husband was to die unless some one could be found who would meet death in his place. His aged father and mother were asked to sacrifice themselves for him, but they refused, and Alcestis finally took upon herself the task of saving him. As he recovered, Alcestis died, but she was brought back from the gate of the tomb by Hercules, or, according to another legend, was sent back by Proserpina after her arrival in the lower world.

ALCHEMY, *al'ke my,* the art which in former times occupied the place of, and paved the way for, the modern science of chemistry, as astrology did for astronomy. Its aims were not scientific, being confined solely to the discovery of the means of prolonging human life and of changing the baser metals into gold and silver. Among the alchemists it was generally thought necessary to find a substance which would possess the power of dissolving all substances into their elements. This general solvent, which, at the same time was to possess the power of removing the cause of disease from the human body and renewing life, was called the *philosopher's stone,* and its pretended possessors were known as *adepts.*

It is thought that alchemy originated in Egypt. From Egypt the art was carried to Arabia, where in the eighth century a school of alchemy published the first known work on chemistry proper. From Arabia alchemy found its way into Europe, where the earliest genuine works on the subject are those of Roger Bacon and Albertus Magnus, written in the thirteenth century. Thomas Aquinas was another noted alchemist. But more famous than all the other was Paracelsus, a Swiss physician, whose work was very important towards developing the manufacture of drugs. He was followed by Lavoisier, Priestley and Scheele, who, by the use of balances, tested the results of alchemy and laid down the principal ideas of modern chemistry. See CHEMISTRY.

ALCIBIADES, *al si bi'a deez,* (about 450–404 B. C.), an Athenian general and politician, the nephew of Pericles. In youth he was remarkable for his dissolute life. He came under the influence of Socrates, but

even Socrates was unable to turn him from his vicious habits. After the death of Cleon he attained a political ascendency which left him no rival but Nicias. He played an important part in the Peloponnesian War, in 415 advocated the expedition against Sicily and was chosen one of the leaders; but before the expedition sailed he was accused of mutilating the statues of Hermes, on one of his midnight carouses. Rather than stand his trial he went over to Sparta, divulged the plans of the Athenians and assisted the Spartans in defeating them. Learning of a plot against his life formed by the jealous Spartan generals, he left Sparta and took refuge with the Persian satrap Tissaphernes. He began to intrigue for his return to Athens, offering to bring Tissaphernes over to the Athenian alliance, and finally his banishment was canceled. He remained abroad, however, in command of the Athenian forces, and took Chalcedon and Byzantium. In 407 he returned to Athens, but in 406 he was deprived of his command. He again sought refuge in Phrygia, and there he was assassinated.

AL'COHOL, or **ETHYL ALCOHOL** (sometimes called spirits of wine), a chemical compound appearing as a limpid, colorless liquid, with an agreeable smell and a strong, pungent taste. It is composed of carbon, hydrogen and oxygen, in the proportions of 2 to 6 to 1, respectively.

Alcohol has been known from great antiquity and is still used in large quantities in the arts and sciences; it forms the vital principle in all the spirituous liquors consumed in the world. It is the alcohol in them that makes wine, whisky, brandy and other liquors intoxicating, and the strength of the liquor varies with the quantity of alcohol it contains. When brandy, whisky and other spirituous liquors, themselves distilled from cruder materials, are again distilled, highly volatile alcohol is the first product to pass off. Charcoal and carbonate of soda, put in the brandy or other liquor before distillation, partly retain the fusel-oil and acetic acid it contains. The product thus obtained by distillation is called *rectified spirits* or *spirits of wine,* and contains from 60 to 95 per cent of alcohol, the rest being water.

By distilling rectified spirits over carbonate of potassium, powdered quicklime or chloride of calcium, the greater part of the water is retained and nearly pure alcohol passes over. The last traces of water can be removed only by a long and varied process involving another distillation. The specific gravity of alcohol varies with its purity, decreasing as the quantity of water it contains decreases. By simple distillation the specific gravity of alcohol can scarcely be reduced below .825 at 60° F.; by rectification over chloride of calcium it may be reduced to .794; in its ordinary form it is about .820. Under a barometric pressure of 29.5 inches it boils at 173° F.; in the exhausted receiver of an air pump it boils at ordinary temperatures. Its very low freezing-point renders it valuable for use in thermometers for very low temperatures. Alcohol is extremely inflammable, and burns with a pale-blue flame, scarcely visible in bright daylight.

Denatured Alcohol. When alcohol is rendered unfit for drinking and some other special purposes, by having other substances mixed with it, it is said to be *denatured.* The Germans have taken the lead in the production of denatured alcohol. Their process consists in mixing with pure alcohol wood spirit, small quantities of benzol pyridin and oil of lavender or rosemary. The United States government removed the tax on denatured alcohol in 1907, thus making it inexpensive. It is used for heat, light, power and a number of manufacturing purposes. See WOOD SPIRIT.

ALCOHOLISM, *al'ko hol izm,* a condition resulting from the habitual or excessive use of alcoholic beverages. Alcoholism is a form of poisoning. There are two marked phases of the disorder, called acute and chronic alcoholism. The former may manifest itself in a wild emotional orgy, and the patient when in throes of this paroxysm may commit dreadful crimes. Other alcoholics sometimes pass into a condition of coma, which may end in death.

Chronic alcoholism is the result of long-continued drinking. The nervous system, breathing organs and circulation are usually affected, and there may be liver and kidney complications. Common symptoms of chronic alcoholism include dyspepsia, heart burn, palpitation, faintness, lung congestion and bronchial catarrh. A mottled and reddish appearance of the complexion, resulting from disturbance of the circulatory system, is generally noticed, and there is liable to be an accumulation of fat in the muscles. The first essential for the cure of

alcoholism is abstinence from alcoholic drinks. This must be followed by a systematic building up of the weakened body. Severe cases are usually most successfully treated in sanitariums.

ALCOTT, *awl'kut*, AMOS BRONSON (1799–1888), an American writer, the father of Louisa M. Alcott, and one of the leaders in the Transcendental school of philosophy (see TRANSCENDENTALISM; BROOK FARM). He was born in Wolcott, Conn., and was for years a prominent figure in the New England renaissance. Mr. Alcott was widely known as a lecturer and writer on speculative and practical themes. Among his publications are *Tablets, Concord Days, Table Talk* and *Sonnets and Canzonets.* See halftone, CONCORD.

ALCOTT, LOUISA MAY (1832–1888), an American writer, famous as the author of a popular series of stories for children. She was born in Germantown, Pa., the daughter of Amos Bronson Alcott. For a number of years she wrote for periodicals, while a school teacher. In 1862 she served as a volunteer nurse in military hospitals, and the letters which she wrote for a newspaper during that time were later collected as *Hospital Sketches.* In 1866 Miss Alcott visited Europe, and on her return wrote *Little Women,* a book that at once established her popularity. Some of her other publications have been almost equally popular, although none of them has quite the charm of the earlier work. Among these other books are *Little Men, Jo's Boys, An Old-Fashioned Girl, Eight Cousins, Under the Lilacs* and *Rose in Bloom.*

LOUISA M. ALCOTT

Orchard House, in Concord, the old home of the Alcott family, is preserved as a memorial of the children's favorite author. For other interesting facts, consult the article READING.

ALDEN, *awl'den*, HENRY MILLS (1836–), an American author and editor, born in Vermont. He studied at Williams College and at Andover Theological Seminary, but never entered the ministry. He married and settled in New York in 1861, became managing editor of *Harper's Weekly* in 1863, and after 1869, as editor of *Harper's Magazine,* devoted himself to the advancement of American culture. He was a collaborator in *Harper's Pictorial History of the Great Rebellion* and has written some verse and several admirable metaphysical essays, including *A Study of Death.* With William Dean Howells, Alden edited several collections of stories.

ALDEN, ISABELLA MCDONALD (1841–), an American author, best known through her stories for young people. Of these, under the pen name of "Pansy," she wrote about sixty. Mrs. Alden was born in Rochester, N. Y. She was editor of several religious papers, including the *Christian Endeavor World,* and wrote some serious books for adults, among which is a life of Christ.

ALDEN, JOHN (1599–1687), one of the Pilgrim Fathers. The romantic incident of his courtship of Priscilla as the emissary of Miles Standish is preserved in Longfellow's *The Courtship of Miles Standish.* See MULLENS, PRISCILLA.

ALDER, *awl'der,* a genus of plants, of the birch order, consisting of trees and shrubs growing in the temperate and colder regions of the globe. The common alder is a tree which grows in wet places in the United States, Europe and Asia. Its wood, light and soft and of a reddish color, is used for a variety of purposes and is well adapted for such things as are kept constantly in water. The roots and knots furnish a beautifully-veined wood, well suited for cabinet work. The charcoal made from the alder wood is used in manufacturing powder. The bark is used in tanning and leather dressing; by fishermen for staining their nets, and in dyeing different shades of yellow and red. With the addition of copperas, the dye becomes black.

ALDERMAN, *awl'dur man,* the title of a city official who helps make the laws for his municipality. The legislative body of which he is a member is usually known as *city council,* or *board of aldermen.* In most instances the municipality is divided into wards, each one of which elects one or two aldermen to represent it and look after its interests. Cities having two aldermen to a ward usually hold annual elections, one alderman for each ward being elected at such times. There is an tendency towards fewer aldermen in a city.

ALDERMAN, EDWIN ANDERSON (1861–), an American educator, born at Wilmington, N. C. He was graduated at the state university and entered the teaching profession, becoming, successively, superintendent of city schools at Goldsboro, assistant state superintendent of instruction in North Carolina, professor in the state normal college, professor of pedagogy in the University of North Carolina, and, finally, president of that institution. In 1904 he was elected president of the University of Virginia. He is well known as an author and lecturer upon educational and historical topics.

EDWIN A. ALDERMAN

ALDERNEY, *awl'dur ny,* a small island belonging to Great Britian, off the coast of Normandy and sixty miles from the nearest point of England; the most northerly of the Channel Islands. About one-third of the island is occupied by grass lands, and the Alderney cows, named for the island, a small-sized but handsome breed, are famous for the richness of their milk. The climate is mild and healthful. Population, about 2,000.

ALDERSHOT, *awl'dur shot,* ENGLAND, a town and military station in northeast Hampshire. The great military camp there was originated in 1854 by the purchase by the government of a tract of moorland known as Aldershot Heath, within the limits of Surrey, Hampshire and Berkshire. The camp was greatly enlarged after the outbreak of the World War, in 1914. Population in 1911, about 35,000.

ALDRICH, *awl'drich,* NELSON WILMARTH (1841–1915), an American politician, born in Rhode Island. He was a member of the state assembly in 1875 and was elected to Congress in 1878 and again in 1880. In 1881 he resigned to enter the United States Senate as a Republican to succeed General Burnside, and served continuously until 1911, when he refused reëlection in order to devote all his time to the work of the National Monetary Commission. The outgrowth of the work of this commission was the establishment of the Federal Reserve banking system (see BANKS AND BANKING).

ALDRICH, THOMAS BAILEY (1836–1907), an American editor, story-writer and poet. He was for a short time in a New York banking house, but he found his work uncongenial and turned his attention to literature. His first work was done on the staffs of various New York periodicals. From 1881 to 1890 he was editor of the *Atlantic Monthly.* Among Aldrich's best known works are the poems *The Ballad of Babie Bell, Cloth of Gold, Flower and Thorn* and *Unguarded Gates;* while among his prose works perhaps the best known are *The Queen of Sheba, The Story of a Bad Boy, Marjorie Daw* and *Prudence Palfrey.* His prose, like his verse, is light and graceful, but is not distinguished by great depth or power.

ALE, a liquor in which the process of fermentation has been stopped before all the sugar is changed to other compounds. This sugar is changed by later fermentation in the barrel into alcohol and carbonic acid, and this change makes ale stronger and more harmful than beer. The strength of ale depends upon the time given it in which to cure; for mild ale, this is one week; for pale ale, from two to four months, and for strong ale, from ten to fifteen months.

ALEMBERT, *a lahN bare',* JEAN DE ROND D'. See D'ALEMBERT, JEAN DE ROND.

ALEP'PO, a city of Asiatic Turkey in North Syria, the capital of the province of the same name, seventy miles east of the Mediterranean Sea. In 1170 the city was captured by the Crusaders, and in 1516 it came under the power of the Turks. Aleppo has suffered severely from earthquakes and plagues, but it is now a very prosperous city and has an extensive commerce by caravan with Bagdad and other Eastern places. Its most important manufactures are costly silks, flowered and woven with gold and silver threads. During the World War Aleppo was the headquarters of a Turco-German army, and in October, 1918, it was occupied by British forces under General Allenby. Population, estimated at 250,000.

ALEUTIAN, *a lu'shan,* ISLANDS, a group of islands formed by the extension of the peninsula of Alaska, and separating Bering Sea from the Pacific Ocean. There are about 150 islands in the group, and they were formerly known as the Catherine Archipelago. The westernmost island is in the longitude of New Zealand. The chain is in

the shape of an arch. Most of the islands are small, and all have rugged or mountainous surfaces. Hot springs are common, but some of the larger islands contain cool springs and rapid streams. Those containing soil are covered with growths of shrubbery, grass, moss and lichens, but there are no large trees. Until recently it was supposed that these islands were unsuited to any form of agriculture, but the largest have been found well adapted to the raising of live stock, and since 1900 several ranches owned by Americans have been established.

Aleuts, the native inhabitants of the Aleutian archipelago. They are a branch of the Eskimo family, and occupy not only the islands named for them, but also scattered sections in Alaska. About 2,000 Aleuts have survived enslavement (on the part of the Russians) and pestilence. They subsist through fishing and fox trapping, and are considered more intelligent, though less ambitious, than the Eskimos.

ALE'WIFE, a food fish found abundantly along the eastern coast of North America. It is not a large fish, weighing at most not over two pounds, but it makes up in numbers what it lacks in size. During the month of April vast numbers arrive in Chesapeake Bay and neighboring waters to spawn, and f. m 60,000 to 100,000 eggs are laid by each female. The alewife somewhat resembles the shad in color and shape, and is related to that fish and to the herring.

ALEXAN'DER, the name of eight Popes, the earliest of whom, Alexander I, is said to have reigned from 109 to 119.

The most famous is ALEXANDER VI (Rodrigo Borgia, 1431–1503), born in Valencia, in Spain. He was in his early youth a handsome and gallant courtier, practiced alike in all the vices and graces of his time, but he soon developed remarkable executive ability and at the age of twenty-five was appointed a cardinal by his uncle, Pope Calixtus III. At the death of Innocent VIII he became Pope. He set himself the task of reducing the power of the Italian princes and increasing the Papal revenues. Endowed with sagacity and fearlessness, he accomplished all he undertook. Among the events of his reign are the introduction of the *Index Expurgatorius* (index of prohibited books), the partition of the New World between Portugal and Spain, and the death of Savonarola.

Alexander VIII, the last Pope of the name, ruled from 1689 to 1691. He was a Venetian and assisted the Venetians in a war against the Turks.

ALEXANDER, the name of three Scottish kings.

Alexander I (about 1078–1124), a son of Malcolm Canmore and Margaret of England, was a great benefactor of the church and a firm vindicator of the national independence.

Alexander II (1198–1249), succeeded his father, William the Lion, in 1214. He gave aid to the English barons in their struggle with King John for the securing of the Magna Charta.

Alexander III (1241–1285), succeeded his father, Alexander II, in 1249. He brought the Hebrides and the Isle of Man under his sway by the defeat of the Norse king Haakon, in 1263. Alexander was strenuous in asserting the independence both of the Scottish kingdom and the Scottish church against England. Under him Scotland enjoyed greater prosperity than for generations afterward.

ALEXANDER I (1777–1825), emperor of Russia, son of Paul I. On the assassination of his father in 1801, Alexander ascended the throne and concluded peace with Great Britain, against which his predecessor had declared war. The Russian emperor identified himself with the Napoleonic schemes and obtained possession of Finland and territory on the Danube. The French alliance was too oppressive, and Alexander's withdrawal from it led to the French invasion of 1812. In 1813 he published a manifesto which served as the basis of the coalition of the European powers against France. After Waterloo, Alexander, accompanied by the emperor of Austria and the king of Prussia, made an entrance into Paris, where they concluded the treaty forming what is known as the Holy Alliance (see HOLY ALLIANCE). In the early part of his reign Alexander showed liberal tendencies and instituted various reforms; but after the formation of the Holy Alliance he was largely influenced in his policy by the reactionary doctrines of Metternich.

ALEXANDER II (1818–1881), emperor of Russia, who succeeded his father, Nicholas I, in 1855, before the end of the Crimean War. After peace was concluded the new emperor set about effecting the emancipation of the serfs in 1861, a measure which

gave freedom, on certain conditions, to over twenty-two million human beings. Under him, too, representative assemblies were introduced, and he did much to improve education and to reorganize the judicial system. The latter part of his reign witnessed a return to the despotism usually characteristic of the czars, and the result was an ever increasing number of Nihilist risings. Alexander was killed by an explosive missile flung at him by a Nihilist in a street in Saint Petersburg, March 13, 1881. During his reign occurred the Russo-Turkish War, the result of the ambitious Russian designs on Turkish territory.

ALEXANDER III, ALEXANDROVITCH (1845–1894), emperor of Russia, succeeded his father Alexander II, in 1883. His intention was to pursue a more liberal course than his father had done, and he had in fact before his accession come into conflict with his father through his opposition to reactionary methods. However, the excesses of the Nihilists finally forced him to make his reign as despotic and conservative as was that of his father. Nihilism was sternly repressed, but despite this fact several attempts were made on his life. With regard to foreign affairs his policy was one of peace, but he followed the old Russian policy of interfering in the Balkan States. He was succeeded on his death in 1894 by his eldest son, Nicholas, who was deposed by the revolution of 1917.

ALEXANDER THE GREAT, (356–323 B. C.), king of Macedon, the greatest character in history before the Christian era. In early youth Alexander gave evidence of invincible courage, wonderful strength and endurance and boundless ambition. At the age of thirteen he became a pupil of Aristotle. During the lifetime of his father, Philip of Macedon, he shared in the wars for the supremacy of Macedon over the neighboring states of Greece, and on the assassination of his father he came to the throne, at the age of twenty. He put to death several of the murderers of his father and the latter's second wife and infant son. The conditions under which his reign began were far from favorable. His youth and inexperience led the Greek states to think that a revolution would be an easy thing, and the first two years of his reign were chiefly occupied in subduing the revolting cities of Greece and hostile tribes beyond the northern frontier of Macedonia. While he was absent in Thrace it was reported that he had been slain, and a considerable revolt was begun anew in Greece, with Athens and Thebes as its center. Alexander appeared before the latter city; the allies of Thebes, including Athens, deserted her, and the city was taken by storm and totally destroyed, the house of the poet Pindar alone being spared. The remaining states of Greece were pardoned.

ALEXANDER THE GREAT
From a bust in a Berlin Museum.

In the spring of 334 Alexander set out for the conquest of the Persian Empire. With an army of thirty-five thousand he crossed the Hellespont, and at the Granicus he totally defeated a Persian force, thereby opening the gate to all Asia Minor. The next year, on the plain of Issus, the invading force met a great Persian army of 600,000 under the command of Darius III, and the Persians were again routed. Alexander next turned his attention to Phoenicia and Syria, and soon the whole of these provinces submitted to him, excepting the famous city of Tyre, which was only taken after a siege of seven months. Its population of thirty thousand was sold into slavery. The ancient city of Gaza resisted Alexander for two months, and then its citizens met the same fate as those of Tyre.

Egypt alone remained of the Persian provinces on the Mediterranean, and Egypt welcomed Alexander as a deliverer from Persian tyranny. At one of the mouths of the Nile the conqueror founded the city of Alexandria, which became an important factor in the commerce of the Mediterranean. He next proceeded to the famous temple of Jupiter Ammon, in the Libyan desert, and there he had himself declared a son of Jupiter. He then turned his army eastward, to complete his overthrow of the Persian Empire. At Arbela he met the army of the Persians, numbering more than a million, and fought one of the decisive battles of the world, in which he was again successful. He entered Babylon and Susa, which threw open their gates to him, and in the latter city seized for

his own use the rich royal treasure of silver and gold which the Persian kings had been accumulating through the centuries.

Alexander was now regarded by himself and by the Persians as the successor of Darius, who had been slain in the battle at Arbela. The victorious army was next led northward for the subjugation of various tribes about the Caspian Sea, and thence across the Hindu ,Kush into Bactria and Sogdiana. In 327 Alexander led his army

blemish. His uncontrolled passion led him to commit deeds, such as the murder of his dearest friend, Clitus, which he bitterly repented. It is said that he never asked his soldiers to do what he would not do himself. He was a man of fine tastes and a liberal patron of art, philosophy and literature. The effects of his conquests were the ending of the struggle between Greece and Persia and the spreading of Hellenic civilization over Egypt and western Asia. The story of

ALEXANDER'S EMPIRE, AT ITS GREATEST EXTENT

to India, where all the native princes submitted except Porus, a powerful king north of the Indus, who was defeated. Alexander rediscovered the sea-route from the Indus to the Euphrates via the Indian Ocean, an achievement of great importance for the commerce of India. He made Babylon the capital of his vast empire. By means of colonies and intermarriage the peoples of Europe and Asia were to be fused into a single great nation, having common laws, language and ruler. He himself married a daughter of King Darius, and thousands of his soldiers took Asiatic wives. In the midst of his vast projects Alexander was seized by a fever and died at Babylon. Of the generals among whom his vast domain was divided, the most famous was Ptolemy, who founded in Egypt the line of rulers of that name.

Alexander's title to greatness lies in his military achievements and his far-reaching vision of a greater civilization. His insatiate vanity and unchecked excesses are a serious

Alexander's life and conquests is told in many ancient annals and in the romances and legends of many nations.

ALEXAN'DRA (1844–), queen-mother of England, and daughter of Christian IX of Denmark, was born at Copenhagen. On March 10, 1863, she was married to Albert Edward, Prince of Wales, who later reigned as King Edward VII. Her first public act was the opening of the Cambridge School of Art, in 1865, and she was present at the opening of Parliament in 1866. After the death of the Prince Consort, in 1861, Queen Victoria practically withdrew from society, and this made the Princess of Wales the first lady of the country in social matters, a position which she sustained with dignity. At the coronation of Edward VII, August 9, 1902, Alexandra was crowned queen, relinquishing the title to Mary, wife of George V, upon the accession of the latter to the throne in 1910. She is an accomplished musician.

ALEXAN'DRIA, Egypt, an ancient city and seaport, at the northwest angle of the Nile delta, on a ridge of land between the sea and Lake Mareotis. Ancient Alexandria was founded by, and named in honor of, Alexander the Great, in 332 B. C. It was long a great and splendid city, not only the center of commerce between the East and West, but also of Greek learning and civilization, and had a population at one time of perhaps 1,000,000. It was especially celebrated for its great library (see Alexandrian Library) and also for its famous lighthouse, one of the wonders of the world (see Pharos). Under Roman rule it was the second city of the Empire, and when Constantinople became the capital of the East it still remained the chief center of trade; but it received a blow from which it never recovered when it was captured by Amru, general of Caliph Omar, in 641, after a siege of fourteen months. Its ruin was finally completed by the discovery of the passage to India by way of the Cape of Good Hope, which opened up a new route for the Asiatic trade.

Modern Alexandria is built on a peninsula which was formerly the island of Pharos. It is divided into two parts, one of which is inhabited by Mohammedans and the other by Europeans. The latter portion is the better built, and it is here that the finest houses are situated, and also the principal shops and hotels, banks and offices of companies. This part of the city is supplied with gas, and with water brought by the Mahmudieh Canal from the western branch of the Nile. Alexandria is connected by railway with Cairo, Rosetta and Suez. A little to the south of the city are the catacombs, which now serve as a quarry; other relics of antiquity are Pompey's Pillar, ninety-eight feet nine inches high, and a palace built by Mohammed Ali.

Alexandria has two ports, with fine docks and other accommodations. It is one of the chief commercial ports on the Mediterranean and the great emporium of Egypt. The trade of Alexandria is large and varied, the exports being cotton, beans, peas, rice, wheat; the imports, chiefly manufactured goods. At the beginning of the nineteenth century Alexandria was an insignificant place of 5,000 or 6,000 inhabitants. The origin of its more recent prosperity it owes to Mohammed Ali. In 1882 the insurrection of Arabi Pasha and the massacre of Europeans led to the intervention of the British and the bombardment of the forts by the British fleet. When the British entered the city they found the finest parts of it sacked and in flames, but the damage was repaired. Population in 1907, 332,246; in 1914, estimated, 413,611.

ALEXAN'DRIA, La., founded in 1819, is the parish (county) town of Rapides Parish, 194 miles northwest of New Orleans and 123 miles southeast of Shreveport. The first railroad was built to the city in 1880; now the Texas & Pacific, the Saint Louis, Iron Mountain & Southern, the Southern Pacific, the Rock Island, the Louisiana & Arkansas and others of lesser note provide transportation.

The business interests include principally the manufacture of lumber and cottonseed products, railroad shops and iron foundries. The output of lumber products is about $7,000,000 yearly, the city being in the center of a vast yellow pine district. There are a large number of fine buildings. The commission form of government was adopted in 1913. Population, 1910, 11,213; in 1917, 16,232 (Federal estimate).

ALEXANDRIA, Va., the county seat of Alexandria County, on the Southern, the Pennsylvania, the Baltimore & Ohio, the Atlantic Coast Line, the Seaboard Air Line and the Chesapeake & Ohio railroads, and on the Potomac River, 100 miles from its mouth and six miles below Washington. The harbor is here a mile wide, and sea-going vessels come up to the city. There is a large and increasing trade, and the manufactures include shoes, flour, machinery, fertilizers, glass, thread and chemicals.

Alexandria was settled in 1695 as Belhaven, was organized under its present name in 1742, and was incorporated in 1779. One of its most cherished buildings is the old Christ Church, to which George Washington came regularly from Mount Vernon, a few miles farther south, to worship. Population, 1910, 15,329; in 1917, 17,939 (Federal estimate).

ALEXAN'DRIAN AGE, that period of Greek literature and learning that existed at Alexandria in Egypt during the three hundred years that the rule of the Ptolemies lasted (323–30 B. C.), and continued under the Roman supremacy. Ptolemy Soter founded the famous library of Alexandria, and his son, Philadelphus, established a sort

of academy of sciences and arts. Many scholars and men of genius were thus attracted to Alexandria, and a period of literary activity set in, which made Alexandria for a long time the focus and center of Greek culture and intellectual effort.

Among those who there pursued mathematics, physics and astronomy were Euclid, the father of scientific geometry; Archimedes, famous for his researches in physics and mechanics; Apollonius of Perga, whose work on conic sections still exists, and the astronomer and geographer, Ptolemy, whose system of astronomy was in general use until the middle of the seventeenth century. There were also several poets and philosophers of note attached to the school. The Alexandrian Age is noted for its criticism and for the reproducing of the works of Greek authors in permanent and finished form. Because of this its influence extended through many centuries, and is even felt in the classic culture of the present times. See ALEXANDRIAN LIBRARY.

ALEXANDRIAN LIBRARY, the largest and most famous of all the ancient collections of books, planned by Ptolemy Soter, king of Egypt, who died about 283 B. C. His son Ptolemy Philadelphus and succeeding rulers developed and enlarged the library which at its most flourishing period is said to have numbered 700,000 volumes. Many of the books were purchased in Athens, Rome and other countries. The main library was located in the temple of Serapis. Most of the books were burned at the invasion of Alexandria by the Romans under Julius Caesar, and the remainder were destroyed by the Christians in A. D. 391.

ALFAL'FA, a pod-bearing plant resembling clover, which ranks with the most important hay plants in feeding value. Alfalfa reached the North American continent from Chile about the middle of the nineteenth century, but it was known to the Persians over 2,000 years ago. They called it *al-facfacah,* meaning *the best crop.* Since 1900 alfalfa production has greatly increased both in the United States and in Canada, and in the former country it is about one-fifth of all hay produced.

General Description. The plant is remarkable for the depth to which its roots penetrate the soil, ten to twenty feet being common. For this reason it thrives in dry regions where many forage plants could not exist. Above ground alfalfa attains a height of a foot and a half to two feet. It bears leaves in three parts, purplish flowers resembling those of the pea, and small seed pods curiously twisted into spirals. As it is a rapid grower, producing a crop about every forty days during the season of growth, from three to seven crops a year may be harvested.

ALFALFA
a, b, seed pods; c, seeds.

Growth and Cultivation. The readiness with which alfalfa adapts itself to different soils and climates is one of its most striking characteristics. Not only does it prosper in semi-arid regions, with or without irrigation, but in places where the rainfall is as high as sixty-five inches a year; it grows in the lowlands and at elevations of more than a mile above sea level; it can adapt itself to almost any sort of climate found in the United States. It cannot, however, live in a soil containing too much moisture, nor one that is too acid. Ideal conditions are a deep, limy soil with good drainage, and an absence of weeds. The latter are injurious in that their shorter roots take nourishment from the upper soil layers.

Since alfalfa, like other pod-bearing plants, adds nitrogen to the soil through the bacteria that form on the nodules of its roots, fertilizers containing nitrogen are not

necessary for its growth. Artificial liming, however, must sometimes be resorted to, a ton of unslaked lime to the acre being applied one year before the crop is sown. Bacteria do not usually develop spontaneously on the roots of the plant when it is first sown, and for this reason alfalfa growers sprinkle the new field with soil taken from an old field. This practice is called artificial inoculation. In the preparation of the seed bed the ground is plowed six weeks before sowing time. Eight inches is considered an average depth for the seed bed, and the upper two or three inches need fine pulverizing. Seed is sown broadcast or in rows, and from fifteen to thirty pounds to the acre are used. For hay it is customary to make the first cutting when the plants are just coming into bloom, and thereafter every forty days or so, as long as the season lasts.

Uses of Alfalfa. The plant is utilized as pasture grass, and as hay and silage, and is fed to dairy cows, beef cattle, poultry, sheep, horses and hogs. As bees eagerly visit the blossoms, an alfalfa field contributes to the production of honey. An Oklahoma candy maker has experimented successfully with a confection containing finely ground alfalfa, and attempts are being made to use alfalfa flour in bread making. It has been found that dried alfalfa leaves, finely pulverized, make a flour which can be mixed with white, whole wheat or graham flour. Not more than one-tenth of the mixture can consist of alfalfa flour, however, as otherwise the bread or biscuits have a disagreeable weedy taste. The special virtue of alfalfa flour is that it contains protein and alkaline ash, both of which are beneficial to the human system.

As a fodder for farm animals, however, the plant has its widest range of utility. It is richer than clover or timothy in protein, and it has a higher carbohydrate percentage than wheat bran or clover. Recent experiments show that a mixture of two parts of alfalfa and one part of saccharine sorghum makes an excellent silage; this method of using the plant is especially desirable when the last crop is unsuitable for hay.

Production. *In the United States.* Over 16,590,000 tons of alfalfa were produced in 1916. The leading states in amount of crop are Nebraska, Kansas, California and Colorado. Alfalfa growing is increasing rapidly in states east of the Mississippi, but the section west of the river will probably always lead in production.

In Canada. In the west alfalfa growing is receiving much attention. Seed is distributed from the experimental farms at Lethbridge and Lacomb, Alberta, and many ranchers in that province are growing the plant extensively. Alfalfa is raised successfully also in Quebec, Ontario, Manitoba, Saskatchewan and British Columbia.

ALFIERI, *al fya're*, VITTORIO, COUNT (1749–1803), an Italian poet, the first great tragic writer of his country. After extensive European travels he began to write, and as his first play, *Cleopatra*, was received with general applause, he determined to devote all his efforts to attaining a position among writers of dramatic poetry. He gave up everything for his work, even making over his property to his sister, that he might be bound by no ties of home and country. He died at Florence and was buried in the Church of Santa Croce, between Machiavelli and Michelangelo, where a beautiful monument by Canova covers his remains. His tragedies and comedies, while stiff and unnatural, are full of lofty sentiments, and he has served as a model for his successors. Alfieri composed also an epic, lyrics, satires and poetical translations from the ancient classics. His autobiography is of peculiar interest as a frank, sincere account.

ALFON'SO XIII (1886–), king of Spain, son of Alfonso XII. Alfonso XII died before the birth of his son, and Maria Christina acted as regent until her son came of age and formally began his reign, in 1902. During the regency, affairs in Spain were in a most disturbed condition, and in 1898 a war between Spain and the United States occurred, by which Spain lost practically all of its colonies (see SPANISH-AMERICAN WAR). After that time order was gradually restored, and the country began to recover its prosperity. Alfonso was married in May, 1906, to Princess Ena of Battenberg, a granddaughter of Queen Victoria of England and a first cousin of Emperor William II of Germany.

During the World War conditions in Spain became very unsettled; strikes and disorders due to unfavorable economic conditions were frequent, and it is probable that only Alfonso's great personal popularity kept the country from a revolution. The king and queen, the liberals and the common

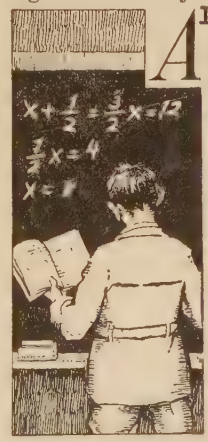
people were generally on the side of the allies, while the military party and the aristocratic classes favored Germany. With his country thus divided, Alfonso displayed good judgment and tact in dealing with a difficult situation. He also showed great kindness and generosity in alleviating the condition of war prisoners and in tracing missing soldiers for their relatives.

AL'FRED THE GREAT (849–901), king of the West Saxons and one of the greatest figures in early English history. He was the youngest son of Ethelwulf, who reigned from 836 to 858. Alfred came to the throne in 871, the intervening thirteen years having been occupied by the reigns of his three older brothers. At his accession Alfred found the country in a desperate state, owing to the inroads of the Danes. He made a truce with them and induced them to turn their attention to the other provinces of Britain, but it was not long before they renewed hostilities. After heroic efforts the Danes were utterly defeated; their leader and his followers accepted Christianity and were assigned territory north of Wessex. Alfred afterward ceded to them the eastern portion of Mercia, which became known as the *Danelagh*. He was then the ruler of nearly all England, though never recognized by title as such.

During the period of peace which followed, he rebuilt cities and fortresses and improved his fleet. Ships were stationed at intervals along the coast to guard against invasion, and they were often useful in repelling the renewed attacks of the Danes. It is to this period that Alfred's most important government reforms and literary labor belong. He established a regular militia, which was able to protect the several parts of the kingdom without leaving any district defenseless; made a code of laws which served as the basis of later codes, and promoted trade and commerce.

Alfred is conspicuous also for the patronage he gave to letters, and his own learning and industrious scholarship are most remarkable. To bring knowledge within reach of his subjects he translated Bede's *Ecclesiastical History of England,* Gregory's *Pastoral Rule* and Boethius's *Consolations of Philosophy,* from Latin into Anglo-Saxon, adding much of his own composition. It was during his reign that the valuable *Anglo-Saxon Chronicle* assumed a systematic form. Alfred represents all that is greatest and best in the early Christian civilization of the West, and was the herald of centuries far removed from him in point of time. He was succeeded by his son, Edward the Elder.

ALGAE, *al'je,* an order of plants, found for the most part in the sea and fresh water, and comprising seaweeds and other common forms. The higher species have stems bearing leaf-like expansions, and they are often attached to the rocks by roots, which, however, do not derive nutriment from the rocks. The stem is frequently absent, the plants being nourished through their whole surface by the medium in which they live. They vary in size from the microscopic diatoms to forms whose stems resemble those of forest trees, and whose fronds rival the leaves of the palm. They are entirely composed of cellular tissue, and many are edible and nutritious, as carrageen, or Irish moss, dulse, etc. Kelp, iodine and bromine are products of various species. The algae are also valuable as manure. About twelve thousand species are known and these are classified in groups according to their color, being recognized as green, brown or red. Most green algae are fresh-water plants (one kind is found on walls, walks and the north side of trees); the brown and red algae are usually confined to salt water.



AL'GEBRA, that branch of mathematics which follows the elements of arithmetic in all schools. It differs from arithmetic in that it treats of the relations and properties of numbers by means of signs and symbols. Within recent years the conclusion has been reached that quite a little of the time given to non-essentials in arithmetic could be spent to better advantage in most schools in laying the foundation of the study of algebra. Some algebraic knowledge may be the best possible aid to a good understanding of much of arithmetic. For these reasons, in many schools the two branches are carried together in upper classes.

Learn Why a Thing Is True. It is our design here merely to lay the foundation for

the study of algebra, to explain the reasonableness of fundamental principles. If this is accomplished to the satisfaction of the student his later successes will come with comparative ease. Too many of us older people accepted algebraic formulas as true without knowing why they were true, or by what process they were reached. We believe all teachers of to-day know that underlying reasons should be explained; their later work will be made easier if they give classes a clear analysis of first principles. If the helper of the boy or girl, either teacher or parent, knows a general fact but knows not why it is true, it will be a means of satisfaction as well as a duty well performed toward those who need instruction to investigate thoroughly. Much of this fundamental help follows in these pages; it opens the way to practically all of the science, as far as it is given consideration in our public school system.

Signs and Symbols. The signs used in arithmetic are applied to algebra without change of form or meaning:

$+$ (plus) indicates addition
$-$ (minus) indicates subtraction
$\times$ (times) indicates multiplication
$\div$ (divided by) indicates division
$=$ is the sign of equality; whatever appears at the left of this sign equals in number, value or amount that which is written at its right. Thus, $7x+5=3x+13$. Seven times the value of x, whatever that may be, added to 5 equals 3 times the same value of x added to 13.

The signs of parentheses, brackets and braces are called signs of aggregation, because everything within them is to be treated as a single expression, to be simplified and reduced to lowest terms before being applied to other parts of the problem. For illustration,

$[10+\{3+6-(4+2)+6\}-4]+8=?$

Here we treat $(4+2)$ in parentheses as a single number, then everything within the braces as a single number, after the part in parentheses has been simplified; finally, after simplifying all that remains within the braces, reduce to simplest form all within the brackets, after which add 8. The same rule applies if the terms enclosed by the signs of aggregation are algebraic. See if you can solve these problems:

$[4a+6a+\{5a-a+(3a+4a)\}-a]=?$
$[6b-3b+4b+(5b+7b)-12b]=?$

Coefficient. The next term you must learn, and one not found in arithmetic, is the word coefficient. It means any number or symbol placed before another symbol, and it stands as a multiplier; the coefficient shows how many times the number or symbol is to be taken. In the term $4y$, 4 is the coefficient of y, and indicates that the value of y is to be taken 4 times; if the value of y happens to be 5, then $4y$ equals 20. In $(a+b)x$, $a+b$ is the coefficient of x, and x is to be taken $a+b$ times; this you will understand better a little later, even without further explanation.

The Signs of Parentheses. If a compound expression is to be treated as a single expression it is to be enclosed in parentheses, as we learned above. The authorities of our algebras tell us that—

If an expression within a parenthesis is preceded by the sign $+$, the parenthesis can be removed without making any change in the signs of the expression, and without altering values.

Let us learn that the above is true without having to accept the word of another. If we prove the truth for ourselves we positively know, and it is good to know things at first-hand:

If a man has 20 dollars and afterwards collects 6 dollars and then 4 dollars, it makes no difference whether he adds the 6 dollars to his 20 dollars, and afterwards the 4 dollars, or whether he puts the 6 dollars and the 4 dollars together and adds their sum to his 20 dollars.

The first process is represented by $20+6+4$.

The second process is represented by $20+(6+4)$.

Hence, $20+(6+4)=20+6+4$.

If this man has 20 dollars and afterwards collects 6 dollars and pays a bill of 4 dollars, it makes no difference whether he adds the 6 dollars to his 20 dollars and pays out of this his bill of 4 dollars, or whether he pays the 4 dollars from the 6 dollars collected and adds the remainder to his 20 dollars.

The first process is represented by $20+6-4$.

The second process is represented by $20+(6-4)$.

Hence, $20+(6-4)=20+6-4$.

If the above explanation is clear you will easily understand the following:

$3+(8-2)=3+8-2$.

$4+(6-3)+(7-2)=4+6-3+7-2$.

The above explanation is in connection with the sign $+$ when it precedes a parenthesis. The authorities in algebra further tell us that—

If an expression within a parenthesis is preceded by the sign $-$, the parenthesis can

be removed, provided the sign before each term within the parenthesis is changed, the sign + to —, and the sign — to +.

This is not quite so easily understood as the principle just explained, so let us carefully examine the matter, using the same illustration we found so serviceable in the first instance:

If a man has 20 dollars and has to pay two bills, one of 6 dollars and one of 4 dollars, it makes no difference whether he takes 6 dollars and 4 dollars in succession, or whether he takes the 6 dollars and the 4 dollars at one time from his 20 dollars.

The first process is represented by 20—6—4.

The second process is represented by 20—(6+4).

Hence, 20—(6+4)=20—6—4.

If this same man has 20 dollars consisting of 5 dollar bills, and has a debt of 6 dollars to pay, he can do this by giving two bills and receiving in return 4 dollars.

This process is represented by 20—10+4.

If the debt paid is 6 dollars, that is (10—4) dollars, the number of dollars he has left can be expressed by 20—(10—4).

Hence, 20—(10—4)=20—10+4.

If the explanation is understood you will readily find answers to the following. We have stated results in three instances:

$10-(9-5)=10-9+5=6$

$7-(3-2)=\ ?$

$9-(4+3)=9-4-3=2$

$(8-2)-(5-3)=8-2-5+3=4$

$15-(10-3-2)=\ ?$

$(3a-2a)-(a-a)=\ ?$

Numerical Values. By way of a review, refer again to the definition of coefficient. It is a multiplier; in the expression $7y$, we understand that y, whatever its value, is to be taken 7 times. Then, if $y=4$, the expression $3y+4y=12+16$, or 28; or, $3y+4y=7y$, or 28. Applying this knowledge, solve the following problems. You will find results stated in a few instances, for your encouragement.

If $a=5$, $b=4$, $c=3$, find the value of:

1. $9a-2bc$. (Ans. 21; here bc are to be
2. $5ac+2a$. multiplied together, and 2
3. $3(a-b+c)$. is their coefficient.)
4. $c+2(a-b)=5$.
5. $2b-3(a-c)$.
6. $2c-b(a-b)$.

Let us solve and explain the last problem, step by step; you will then know whether your methods have been correct:

(1) 2c—b(a—b).

(2) Removing parentheses, 2c—ab+b²; b times b is not 2b, but is the result of b multiplied by itself, as in arithmetic;

(3) Assigning values to the letters, 6—20+16.
Adding terms having plus signs, deducting from the sum the term having a minus sign,

(4) 22—20=2.

Addition. The processes of addition in arithmetic and algebra vary but little. If in arithmetic we add 4 and 5, there is a term known to us which expresses the result of this addition; it is 9. If in algebra we wish to add a and b, there is no single term which will express the sum; the addition of two algebraic expressions can be represented only by connecting the second with the first by the sign +. If there are no like terms in the entire expression whose sum we are required to find, the operation of addition is algebraically complete when the two expressions are thus connected; hence, the sum of x and y is $x+y$.

Add $3x+4y+6x+y$. Here we find like terms twice; hence we combine these like terms before completing our addition, for we must have the expression in its simplest form. So we combine these similar terms:

$$3x+6x=9x$$
$$4y+\ y=5y$$

Therefore we have the complete problem, $3x+4y+6x+y=9x+5y$.

We may give the problem this form:

$$\begin{array}{r} 3x+4y \\ 6x+\ y \\ \hline 9x+5y \end{array}$$

Add the following, remembering that if no sign appears before a term, the plus sign is always understood; and recalling, further, that we express the *sum of coefficients* only:

1. Add: $2c^3-c^2d+6cd^2+d^3$; $c^3+6c^2d-5cd^2-2d^3$; $3c^3-c^2d-7cd^2-3d^3$.

2. Add: $4a^2+3+5$; $-2d^2+3a-8$; a^2-a+1a.

3. Add: $-3a+2b+c$; $a-3b+2c$; $2a+3b-c$.

4. Add: $2a+3b+6y$; $2b-2a+y$; $a-4b-6y$; $a+b+y$.

5. Add: $2a^2+4b-2c$; $3c-2b$; $3c+b-a^2$; a^2+c.

Is it clear why you must arrange this problem in the following order?

$$\begin{array}{r} 2a^2+4b-2c \\ -2b+3c \\ a^2+\ b+3c \\ a^2\quad\ +\ c \\ \hline \end{array}$$

Subtraction. The reason assigned for the rule for subtraction in algebra is sometimes

difficult for the boy and girl to understand. Let us state it as usually given, and explain it step by step, with the practical help of problems. The rule tells us to—

Set the like terms one under the other in the minuend and subtrahend, then change all the signs of the subtrahend and proceed as in addition.

We have learned how to add, and know that the algebraic sum of $8a$ and $-3a$ equals $5a$:

$$\begin{array}{rl} 8a & \text{first number} \\ -3a & \text{second number} \\ \hline 5a & \text{sum} \end{array}$$

In addition in arithmetic, we know that if either number be subtracted from the sum, the difference must be the other number. Here, then, if we subtract $-3a$ from $5a$, what is left must equal the first number, and it is $8a$, no matter how strange the number may look to you. In performing this subtraction, we know that the result reached must be $8a$. So far, simply keep in mind that we have only applied to algebra an arithmetical truth, that either term in addition, if subtracted from the sum, gives the other term as a remainder; no matter how unreal the result of such a subtraction may look to us we are forced to believe it is correct.

See if here is further proof: If we add $-8a$ and $3a$ the sum is $-5a$:

$$\begin{array}{rl} -8a & \text{first number} \\ 3a & \text{second number} \\ \hline -5a & \text{sum} \end{array}$$

Subtract $3a$ from $-5a$ and the remainder, if our rule of arithmetic is true, must be $-8a$, for that is the other number.

Again, the sum of $-8a$ and $-3a$ is $-11a$:

$$\begin{array}{rl} -8a & \text{first number} \\ -3a & \text{second number} \\ \hline -11a & \text{sum} \end{array}$$

Subtract $-3a$ from $-11a$ and the remainder must be the first term, $-8a$.

Now let us show these last three problems in subtraction side by side. We have understood the explanations given, for we know they are based on arithmetical truths we have long known:

Minuend	$5a$	$-5a$	$-11a$
Subtrahend	$-3a$	$3a$	$-3a$
Remainder	$8a$	$-8a$	$-8a$

Note once more that in these problems in subtraction the algebraic sum of each subtrahend and remainder equals its minuend. These, then, are correct solutions of the above problems; and from our experience with them we desire to learn the shortest method for subtraction and the briefest possible rule to apply.

Look at the three problems above. In each the same remainder would have been found had we imagined the signs in the subtrahends to have been changed and the minuends and subtrahends then added. Apply this rule to each of the three examples:

Arrange the problem so that like terms in the minuend and subtrahend will be one above the other; change all the signs in the subtrahend from + to — and from — to + and proceed as in addition. The result will be the remainder sought.

If we have made clear the reason for the above rule a difficult task has been performed.

Multiplication. If we desire to set down graphically the product of $abcx$ and bc^2xy we find the factor b is taken twice, the factor c three times, the factor x twice, and each remaining factor once. Therefore, the result of our multiplication, written in expanded form, is $abbcccxxy$, or, simplified, $ab^2c^3x^2y$.

As in arithmetic, the little figures at the right and slightly above the letter are called exponents, and each indicates the number of times the letter or term is to be taken; a^2 means the *square of* a, or a multiplied by itself, or a raised to the second power. If a stands alone the first power of a, or a^1, is understood. The problem in the paragraph above makes it clear that in multiplication we add the exponents of like terms. Thus, $a^2 \times a = a^2 \times a^1 = a^3$.

Applying the suggestions, note the various steps in the solution of the following problem in multiplication:

$$\begin{array}{r} 5a^2b+2c \\ 2bc \\ \hline 10a^2b^2c+4bc^2 \end{array}$$

The signs in this problem are all +, but it is certain that many will contain the — sign. Let us see what it means. We are required to find the product of $-5x^2y$ and $3x$. Since $-5x^2y$ indicates that $5x^2y$ is to be subtracted, then multiplying $-5x^2y$ is equivalent to subtracting $5x^2y$ $3x$ times, or to subtracting the product of $5x^2y$ and $3x$ once. The product, therefore, is $-15x^3y$.

Observe the analysis of the following

problem: Multiply $-5x^2y$ by $-3x$. To multiply these terms together is equivalent to subtracting $-5x^2y$ $3x$ times. We remember, however, that in subtraction the sign of the subtrahend is always changed, so in subtracting $-5x^2y$ $3x$ times, we have the equivalent of adding $5x^2y$ $3x$ times, or of adding the product of $5x^2y$ and $3x$ once. Therefore, the product in this instance is written $15x^3y$.

Side by side, then, we have these operations in multiplication:

$5x^2y$	$-5x^2y$	$5x^2y$	$-5x^2y$
$3x$	$3x$	$-3x$	$-3x$
$15x^3y$	$-15x^3y$	$-15x^3y$	$15x^3y$

From the above it is evident that when the signs in the multiplicand and multiplier are alike, the product is a positive quantity, taking the sign $+$; when the signs in the multiplicand and multiplier are unlike, the product is a negative quantity, taking the $-$ sign.

When the multiplicand and multiplier each contains more than one term the form of the solution is as follows:

$$\begin{array}{r} 2a+3b \\ 2a-3b \\ \hline 4a^2+6ab \\ \quad -6ab-9b^2 \\ \hline 4a^2 \quad -9b^2 \end{array}$$

For practice solve these problems:

1. Multiply $5x-3y$ by $5x-3y$.
2. Multiply $a-7b$ by $a-5b$.
3. Multiply $x^2+5x-10$ by $2x^2+3x-4$.
4. Multiply $a^2-3ab-b^2$ by $-a^2+ab+2b^2$.
5. Multiply a^2-ab+b^2 by $a+b$.

Division. In multiplication the exponents of like terms in the multiplicand and multiplier are added in the product; as division is the reverse of multiplication, we subtract the exponents in the dividend and divisor to determine their power in the quotient. Let us see if this does not seem reasonable:

Divide a^3 by a.

$$a^1)\ a^3\ (a^2$$

Proof: $a^2 \times a = a^3$.

Another way of showing this division is the following:

Divide a^3 by a.

$$a^3 = aaa$$

Divide aaa by a

$$\frac{aaa}{a^1} = aa$$

$$aa = a^2.$$

Divide $3a^4b^2c-9a^3bc^2-6a^2c^3$ by $3a^2c$.

Solution: $\dfrac{3a^4b^2c-9a^3bc^2-6a^2c^3}{3a^2c} =$

$$\frac{3a^4b^2c}{3a^2c} - \frac{9a^3bc^2}{3a^2c} - \frac{6a^2c^3}{3a^2c} =$$

$$a^2b^2-3abc-2c^2$$

In long division, for convenience in multiplying, the divisor is usually written at the right of the dividend instead of at the left as in arithmetic. Note the form of the solution:

$$\begin{array}{l} 2a^2+5ab+3b^2 \quad (2a+3b \\ \underline{2a^2+3ab} \qquad\quad (\ a+b \\ \quad 2ab+3b^2 \\ \quad \underline{2ab+3b^2} \end{array}$$

By inspection it is found that $2a$ will be contained in the first term of the dividend a times. Multiply this partial quotient a by the entire divisor, placing the product under the first terms of the dividend, then subtract; bring down with the remainder the next unused term of the dividend. By inspection it is found that the first term of the divisor is contained in the new dividend b times. Multiply the new partial quotient by the entire divisor, and proceed as before.

Observe that when the signs of the dividend and divisor are alike, the quotient is a positive quantity, or $+$; when the signs of the dividend and divisor are unlike, the quotient is a negative quantity, always $-$. Apply the above truth to the following problem. Follow the solution very carefully step by step:

Divide x^4+4a^4 by $x^2+2ax+2a^2$.

Solution:

$$\begin{array}{l} x^4+4a^2 \qquad\qquad (x^2+2ax+2a^2 \\ \underline{x^4+2ax^3+2a^2x^2} \quad (\underline{x^2-2ax+2a^2} \\ \quad -2ax^3-2a^2x^2 \\ \quad \underline{-2ax^3-4a^2x^2-4a^3x} \\ \qquad\qquad 2a^2x^2+4a^3x+4a^4 \\ \qquad\qquad \underline{2a^2x^2+4a^3x+4a^4} \end{array}$$

Note that new partial dividends have been brought down with respect to the *ascending* powers of a. Solve the following problems:

1. Divide $9a^2-18ay+9y^2$ by $3a-3y$.
2. Divide $y^2-12y+35$ by $y-5$.
3. Divide $3a^4-10a^3b+22a^2b^2-22ab^3+15b^4$ by $a^2-2ab+3b^2$.
4. Divide $x^5-2x^4-4x^3+19x^2-31x+15$ by x^3-7x+5.
5. Divide x^4+64 by x^2+4x+8.

Simple Equations. It is not necessary to enter upon a long and detailed explanation of the equality of two or more terms connected by the sign $=$. A brief illustration

will make the principle clear to every beginner in algebra.

The ordinary balance scale will serve our purpose. In one pan we place a 5-pound

THE BALANCE SCALE

weight; in the other we place a 3-pound weight and a 2-pound weight; we know the first weight balances the other two, and we may indicate the fact by the following statement:

$$5=3+2$$

Adding 4 pounds to each pan, our new statement is,

$$5+4=3+2+4$$

Removing 2 pounds from each pan, we write the new condition.

$$5+4-2=3+2+4-2$$

These statements are called *equations,* and from them we may easily assume each of the following principles to be true:

1. The same quantity may be added to both sides.

2. The same quantity may be subtracted from both sides.

3. Each side may be multiplied or divided by the same number.

In the equation $7x+4=32$, there is balanced value, or quantity; it tells us that $7x$ does not equal 32, but that to $7x$ we must add 4 to equal 32, or that 32 is 4 more than $7x$. So we must substract 4 from 32 if we want to know the number which exactly equals $7x$. Then our revised equation will be,

$$7x=32-4$$

Simplifying,

$$7x=28$$
$$x=4$$

We moved 4 to the right of the equation and in doing so changed its sign from + to —, the reason for which is clear from the explanation above. At the same time we placed all known quantities, 32 and 4, on the same side of the equation, leaving the unknown quantity on the left. These two principles embody the philosophy of the simple equation. Let us apply what we have learned to several problems:

1. A 60 foot pole is divided into two parts so that one part is 5 times as long as the other; find the length of the two parts.

The length of neither part is known, therefore let us represent the shorter length by the letter x, to indicate that its numerical value is not known but is to be found. Then,

x=shorter part,
$5x$=longer part,
$6x$=both parts,
$6x=60$ feet.

Therefore, $x=10$ feet, the shorter part,
and $5x=50$ feet, the longer part.

2. Find a number such that when 17 is added to its double, the sum will be 49.

The unknown number may be represented by x and we must also find a number just double the unknown number. Then,

x=the number,
$2x$=double the number.

Now if we add 17 to double the number, the sum will be 49. Therefore, it is evident that 49 is 17 more than double the number, or in other words, that to double the number we must add 17, if we would reach the result 49. We have our statement

$$2x+17=49.$$

Then, if 49 is 17 more than $2x$, we should subtract 17 from 49, which is the same as subtracting 17 from both sides of the equation, and we have,

$$2x=49-17$$

Then,

$$2x=32$$

and

$$x=16.$$

Using the above problems as types, solve the following:

1. If the sum of the ages of a father and son is 60 years, and the father is 5 times as old as the son, what is the age of each?

2. A tree 90 feet high was broken so that the part broken off was 8 times the length of the part left standing. Find the length of each part.

3. Three times a given number is equal to the number increased by 40. Find the number.

4. The yield of an orchard was 70 bushels of fruit. Three times the number of bushels of apples is 6 more than the number of bushels of pears. Find the number of bushels of each.

5. A horse, a cow, and a sheep together cost $106. The cow cost sixteen times as much as the sheep, and the horse cost $40 more than the cow. What was the cost of each?

PROBLEMS INVOLVING TWO UNKNOWN QUANTITIES

In the equations above we have had to deal with problems in which only one quantity was unknown. The next step in advance introduces us to a slightly more complex form of example in which two quantities are unknown, but which will give us no trouble if there has been a clear understanding of the principle underlying solutions where there was but one unknown quantity.

Three Methods. There are three methods commonly employed in the solution of any problem involving two or more unknown quantities. These are principles by which one unknown term is first eliminated—that is, by which its numerical value is found—this new value then being placed in the original equation as a substitute for its former unknown value. These three processes are called elimination by addition or subtraction, elimination by substitution and elimination by combination.

By Addition or Subtraction. The first is probably the easiest form and almost any problem can be solved by this process. Let us explain in detail a problem in which we must find the value of two unknown numbers or quantities; we will perform the operation by elimination by addition or subtraction:

Solve $\begin{cases} 3x+4y=34 \\ 6x+3y=33 \end{cases}$

By careful inspection we find that if we multiply the first equation by 2, we will have for its first term $6x$, which is exactly equal to the first term in the second equation. The whole product will be $6x+8y=68$. We can now subtract from this equation the second equation of the problem and we shall find our difference to be $5y=35$. These first few steps in the solution of the problem are given in detail below:

(1)	$3x+4y=34$
(2)	$6x+3y=33$
(3) Multiplying (1) by 2	$6x+8y=68$
(4) Bringing down (2)	$6x+3y=33$
(5) Subtracting	$5y=35$
(6)	$y=7$

If y equals 7, it is easy to apply the value of y in either of the original equations, or, to use a technical term, substitute in equation (1) or equation (2) the value of y.

Knowing that y equals 7 we put the value of $4y$ instead of that term in the first equation, and we have $3x+28=34$. The two known quantities are not on the same side of the sign of equality, so we will transpose, which gives us the equation $3x=34-28$, or $3x=6$, and $x=2$. Now we may finish the statement of the solution of the problem, as follows:

(7) Applying value of y in (1).	$3x+28=34$
(8) Transposing	$3x=34-28$
(9) Then	$3x=6$
(10) Therefore	$x=2$
(11) Proof	$6+28=34$

It would be well for the beginner in algebra to write out as fully as appears in the eleven steps above the solution of every problem he attempts, until the orderly plan is well understood. Solve the following problems, eliminating in each one unknown quantity either by addition or subtraction. It may be necessary sometimes to multiply both given equations by such numbers as will make elimination of one unknown term possible. For instance, in the first problem given below if we wish to eliminate y at first we can multiply the first equation through by 3 and the second through by 5. This will give us $15y$ in each equation, and we may then eliminate y by addition.

1. Solve $\begin{cases} 6x-5y=10 \\ 5x+3y=37 \end{cases}$
2. Solve $\begin{cases} 2x+5y=23 \\ 4x+3y=25 \end{cases}$
3. Solve $\begin{cases} 4x-3y=0 \\ 5x+2y=60 \end{cases}$

Elimination by Substitution. This is the process of clearing an equation of one of its unknown terms by substituting in either equation the value of one of its unknown terms, in the following manner:

Solve $\begin{cases} 2x+5y=31 \\ 3x+4y=29 \end{cases}$

The first step is to find the value of either x or y. We will write the first equation in another form which the student will understand:

$$y=\frac{31-2x}{5}$$

Now we can write the second equation of the problem by placing our new value of y in it, and we have,

$$3x+4\left(\frac{31-2x}{5}\right)=29$$

Applying your knowledge of arithmetic to the above fraction we will perform the

operation which is called clearing of fractions, and we shall then have,

$$3x+\left(\frac{124-8x}{5}\right)=29,$$

which, reduced still further, equals $15x+124-8x=145$. Transposing the known quantities to the right of the sign of equality, we have $15x-8x=145-124$. Now let us place this entire problem in formal order as directed in the explanation of the problem involving elimination by addition or subtraction:

(1)	$2x+5y=31$
(2)	$3x+4y=29$
(3) Transposing 2x in (1) and dividing by 5	$y=\frac{31-2x}{5}$
(4) Substituting the value of y in (2)	$3x+4\left(\frac{31-2x}{5}\right)=29$
(5) Clearing of fractions	$15x+124-8x=145$
(6) Transposing 15x	$-8x=145-124$
(7)	$x=3$
(8) Substituting the value of x in (3)*	$y=\frac{31-6}{5}$
(9)	$y=5$

Solve the following problems, eliminating by substitution:

1. Solve $\begin{cases}5x-4y=-2\\4x-6y=-10\end{cases}$
2. Solve $\begin{cases}7x-4y=20\\3x+2y=42\end{cases}$
3. Solve $\begin{cases}7x+2y=24\\6x-y=7\end{cases}$

It frequently happens that there will be three unknown quantities, the values of all of which are to be found. Such a problem presents no more difficulties than any of the above, for the student should apply the rules for elimination to two of the given equations and find the values of two of the unknown quantities, then substitute these values in connection with the third unknown quantity. Such a problem, with full solution, is given below:

Solve $\begin{cases}x+y+z=6\\2x+3y+4z=20\\3x-4y+6z=13\end{cases}$

(1)	$x+y+z=6$
(2)	$2x+3y+4z=20$
(3)	$3x-4y+6z=13$
(4) Bring down (2)	$2x+3y+4z=20$
(5) Multiply (1) by 2	$2x+2y+2z=12$
(6) Subtract	$y+2z=8$
(7) Bring down (3)	$3x-4y+6z=13$
(8) Multiply (1) by 3	$3x+3y+3z=18$
(9) Subtract	$-7y+3z=-5$
(10) Multiply (6) by 7	$7y+14z=56$
(11) Add (9) and (10)	$17z=51$
(12) Therefore	$z=3$
(13) Substituting in (6)	$y+6=8$
(14)	$y=2$
(15) Substituting in (1)	$x+2+3=6$
(16)	$x=1$
(17) Proof	$1+2+3=6$

Solve the following problems and prove the correctness of your work in each instance:

1. Solve $\begin{cases}x-y+2z=7\\3x+2y-z=8\\4x-3y+z=3\end{cases}$
2. Solve $\begin{cases}5x-6y+4z=15\\7x+4y-3z=19\\2x+6y+6z=46\end{cases}$

3. A farmer sold 10 barrels of apples and 3 barrels of potatoes for $29; and at the same rate 4 barrels of apples and 5 barrels of potatoes for $23. Find the price of each a barrel.

If the student states clearly a problem such as the above, he will have no difficulty with any part of it. The statement of this is as follows:

x=value of 1 barrel of apples,
y=value of 1 barrel of potatoes,
$10x+3y=29$
$4x+5y=23$

Solve according to instructions governing the solution of problems involving two unknown quantities.

4. Two numbers are such that 3 times the first plus 5 times the second equals 44; but 3 times the second plus 6 times the first equals 60. What are the numbers?

5. A book-seller sells 3 bound copies of a work and 7 stitched copies. He receives for them all $32.40. Another day he sells 2 bound copies and 5 stitched copies for $22.60. How much does a stitched copy cost, and how much a bound copy?

Advance Work. We have covered the fundamental principles of algebra in the foregoing pages. The subject of fractions involves no new theory; it requires simply arithmetical knowledge of fractions added to the algebraic principles which have here been described. If one learns thoroughly what has been given in these pages he can proceed intelligently to the study of factoring, highest common divisor, the least common multiple, and on through quadratic equations.

The subject of algebra is fascinating as a study, but it is an exacting science. The slightest mistake, even in the change of one sign, destroys the work of an entire problem. There is really no better subject that the boy or girl can study to develop care and painstaking accuracy.

*It would be as well to substitute the value of x in either (1) or (2) as in (3).

ALGECIRAS, *al je si'ras*, SPAIN, a seaport in the province of Cadiz, on the west side of the Bay of Gibraltar. It is well built and has a strongly protected harbor. It was the first conquest of the Arabs in Spain, in 711, and was held by them till 1344, when it was taken by Alfonso XI of Castile, after a siege of twenty months. Near Algeciras, in 1801, the English admiral Saumarez defeated the combined French and Spanish fleets, after having failed in an attack a few days before. In 1906 at Algeciras was held the Moroccan conference, which was called to settle whether German or French influence should be paramount in Morocco. At this convention an act was formulated which paved the way to French control in Morocco, and proved to be an indirect cause of the World War of 1914 (see MOROCCO). Population, 1910, 15,000.

ALGER, *al'jer*, HORATIO (1834–1899), an American author of books which deal largely with the life of self-supporting boys. His stories are very numerous, and at one time they were extremely popular, but are now less read than formerly. The type of Alger story is shown in such titles as *Ragged Dick, Tattered Tom* and *Luck and Pluck*. Alger was born in Natick, Mass., and was educated at Harvard University.

A Young Algerian

ALGERIA, *al je'ri a*, a country in the northern part of Africa, under the jurisdiction of France (see colored map with article AFRICA). It consists of two main divisions—Northern Algeria, lying between Tunis and Morocco, and the Southern Territories. Northern Algeria has an area of 80,208 square miles and a population of 5,069,522 (1911). For administration purposes it is divided into three departments—Algiers, Oran and Constantine. The Southern Territories, whose southern boundaries lie indefinitely in the Sahara Desert, have an area of about 141,911 square miles, and a population of about 494,300. The city of Algiers (which see) is the seat of government. The Atlas Mountains traverse the country in two ranges, one of which is parallel to the coast; the other is farther inland. The latter attains an elevation of 7,000 feet. The climate varies according to elevation and local conditions. There are three seasons: winter, from November to February; spring, from March to June, and summer, from July to November. In general the summer is hot and dry, but in many places along the coast the temperature is moderate; in winter the climate is so pleasing that Algeria is an important health resort.

The chief agricultural products are wheat, barley, oats, tobacco, cotton, grapes, silk and dates. Early vegetables are also raised in considerable quantities and exported to France and England. Algeria is also the home of the esparto grass, extensively used in the manufacture of paper. The forests contain pine, oak, ash, cedar, myrtle and a number of different gum trees. A large quantity of lumber is produced, and Algeria ranks sixth among the lumber-producing countries under European jurisdiction. It is also an important wine-producing country. There are valuable deposits of iron, copper, lead, sulphur, zinc, antimony and marble.

In addition to the exports mentioned above, wine, olive oil, hides, wood, wool, tobacco, oranges and other fruits are exported. The imports consist of manufactured goods, coffee, furniture, machinery and coal. The manufacturing industries are unimportant, but include morocco leather, carpets, muslins and silks. The French system of weights and measures and French money are generally used. The chief towns are Algiers, Oran, Constantine, Bona and Tlemcen. The highways are in charge of the government and are kept in excellent condition. There are about 2,800 miles of railway in the country, besides telegraph lines connecting all the principal points.

The native inhabitants include Arabs and Berbers. The Arabs are wanderers, dwelling in tents and frequently moving from place to place. They have occupied the country since the twelfth century. The Berbers are the original inhabitants of the territory and form a considerable part of the population. They speak the Berber language, but use Arabic characters in writing. The Jews form a small part of the population, and there are over 400,000 colonists of French origin and over 200,000 who are natives of other European countries, chiefly Spain and Italy. The country is governed by a gov-

ernor general, who is assisted by a council.

History. Algeria was known to the Romans as Numidia, and under their rule was very prosperous. It was conquered by the Vandals in A. D. 430 and was recovered by the Byzantine Empire about a century later. About the middle of the seventh century it was overrun by the Saracens. Moors and Jews who were driven out of Spain by Ferdinand and Isabella at the end of the fifteenth century settled in Algeria, but the country was soon made tributary to Spain. Later it came under the protection of Turkey, and for some centuries was noted for the system of piracy practiced by its inhabitants. This was suppressed in 1830.

ALGIERS, *al jeerz',* ALGERIA, a city and seaport on the Mediterranean, capital of the country (see ALGERIA). It is situated on the Bay of Algiers, partly on the slope of a hill facing the sea. The old town, which is the higher, is oriental in appearance, with narrow, crooked streets, and houses that are strong, prison-like edifices. The modern French town, which occupies the lower slope and spreads along the shore, is handsomely built, with broad streets and elegant squares. There is a large shipping trade carried on, chiefly with France, but also with England, Spain and Italy. The climate of Algiers, though extremely variable, makes the city a very desirable winter residence for invalids and tourists. Population, 1911, 172,397.

ALGOA BAY, *al go'ah,* a bay situated on the south coast of Cape of Good Hope Province, 425 miles northeast of the Cape of Good Hope. It has an excellent harbor and is the only place of shelter along a great stretch of coast for vessels during the northwest gales. The usual anchorage is off Port Elizabeth, on its west coast. Owing to the advantages of the harbor, this town has become one of the most important commercial points of South Africa.

AL'GOL, a remarkable star situated in the constellation of Perseus. For more than one hundred years it was recognized as variable, growing brighter at certain regular intervals, then fading away. For a long time this phenomenon puzzled the astronomers exceedingly, but it has now proved that most of the conditions may be accounted for by the presence of a satellite revolving about Algol. Measurements show that Algol is something over 1,000,000 miles in diameter, and its satellite about 830,000 miles.

ALGON'KIAN SYSTEM, the name given in the United States to a great system of rocks between the Archean below and the Cambrian above. All the formations are metamorphic or sedimentary, and are elastic and highly crystalline. They comprise granites, marbles, schists, slates, quartzites and conglomerates. The rocks contain but few fossils, and these are indistinct. The system is remarkably well developed around Lake Superior, where, in addition to the classes of rocks named, are found dikes and beds of igneous rock, and the great deposits of iron and copper which are among the richest in the world. *Algonkian* has the same meaning as *Proterozoic;* the latter term is now used by many geologists.

Related Articles. Consult the following titles for additional information:
Archean System
Cambrian System
Geology
Paleozoic Era.

ALGONQUIAN, *al gon'kwe an,* **INDIANS,** the largest and most widely scattered group of tribes in North America. They inhabited the land from Labrador southwest to the Carolinas and Tennessee, and west to the Rocky Mountains, surrounding the Iroquoian and bordering on the Siouan to the west and south, and the Athapascan tribes to the northwest. Nearly two-thirds of the 90,000 now living are in Canada. The Algonquians were a fierce people, and wherever they met the European colonists long and bloody wars followed until the natives were driven across the Alleghanies. Throughout the French and Indian wars they sided with the French and stubbornly fought against the English; in the end, as was the case with more peaceful tribes, they found themselves confined to scattered reservations west of the Mississippi. The Canadian Algonquians were better treated, and now live not far from their original homes.

Corn was a great staple among the Algonquians, who cultivated the soil about their permanent homes of bark and logs. Among the chief tribes of this family are the Narragansett, Pequot, Delaware, Ottawa, Ojibwa, Miami, Illinois, Kickapoo, Pottawatomi, Arapahoe and Cheyenne; to each of these is given a brief article in this work.

ALGONQUIN, PARK, a forest and game reservation in the Canadian province of Ontario, consisting of about 2,000 acres of virgin woodlands. The park is over 1,500 feet above the sea, and contains hundreds of lakes well stocked with fish.

THE ALHAMBRA, GRANADA, SPAIN

Birds, beaver, otter, deer and other game are found in large numbers, but hunting within the confines of the park is prohibited. Though the park is a bit of primitive and unmolested forest, it is reached without difficulty. The city of Toronto is 200 miles south by rail, and the preserve is less than seventy-five miles from the shore of Georgian Bay.

ALHAM'BRA, a word meaning *red castle,* was the citadel and palace of the Moorish kings of Granada, standing on a hill surrounded by a wall flanked by many towers, and having a circuit of two and a quarter miles. It was begun about 1248 and was captured by Ferdinand and Isabella in 1492, when the Moors were driven from Spain. Charles V and Philip V later mutilated it, and though it has suffered much from fire and time it still remains the finest example of Moorish art in Spain. Artists and architects of later times have copied from the palace, and Washington Irving has written its most interesting legends in *The Alhambra.*

A'LIAS, in law, a term used to denote the different names assumed by a person in order to conceal his true name. The term can be applied only when a person is known to have acted under the various names.

ALICE'S ADVENTURES IN WONDERLAND, a charming story for children, written by Charles L. Dodgson under his pen name of "Lewis Carroll." It is supposed to be a dream of one of Dodgson's little friends, Alice Liddell of Oxford. Sir John Tenniel, a famous English cartoonist, made the illustrations for the story, picturing with unsurpassed skill the White Rabbit, the Cheshire Cat, the baby who turned into a pig, Alice in all her various guises, and a host of other picturesque characters. The book was published in 1869. Its sequel, *Through the Looking-Glass,* appeared in 1871. *Alice's Adventures in Wonderland* has been dramatized with charming effect.

ALIEN, *ayl'yen,* in relation to any country, is a person born out of its jurisdiction and not having acquired the full rights of its citizenship. The position of aliens differs in the countries of the world, but, generally speaking, they owe a local allegiance and are bound equally with natives to obey all general rules for the preservation of order. In the United States in peace times aliens may acquire and hold real property without restriction, except in some states. Personal property they can take, hold and dispose of, like native citizens. Individual states have no jurisdiction on the subject of naturalization, though they may pass laws admitting aliens to any privilege short of citizenship. Five years' residence in the United States and one year's residence in the state where the application is made are necessary for the attainment of citizenship in the United States. In the reconstruction period following the World War hundreds of aliens who encouraged efforts to overthrow the American government were deported. See NATURALIZATION.

ALIEN AND SEDITION LAWS, a series of laws enacted in 1798 by the United States Congress, during the Presidency of John Adams. The alien law gave the President power to order aliens out of the country upon suspicion of political activity or for other reasons. The sedition law imposed a fine and imprisonment on those who conspired to resist government measures or who published libelous or scandalous statements concerning Congress or the President. The chief occasion of these laws was the activity in opposition to the administration of those who sympathized with French interference in American affairs. The passage of the laws aroused such intense opposition that the Federalists were soon driven from office and never regained control of the government. In 1918 Congress passed a bill containing drastic penalties for seditious sayings and acts, but the country accepted this act as a necessary war measure.

ALIMEN'TARY CANAL, a common name given to that portion of the digestive apparatus which begins at the mouth and includes the pharynx, oesophagus, stomach and intestines. Its length is about thirty feet in an adult, or five or six times the height of the individual. It is lined throughout with a mucous membrane which in different parts gives off the secretion peculiar to each. Its muscular coat has the power to force food along. See INTESTINES; STOMACH.

ALIZ'ARIN, a substance contained in the madder root, and used in dyeing reds of various shades. Formerly madder root was employed as a dyestuff, but now the use of the root has been almost superseded by the employment of alizarin itself, prepared artificially from one of the constituents of coal tar.

AL'KALI, a term first used to designate the soluble part of the ashes of plants, especially seaweed. Now the term is applied to various classes of bodies having the follow-

ing properties in common: (1) solubility in water; (2) power of destroying the property of acids, and forming salts with them; (3) the property of corroding animal and vegetable substances; (4) the property of changing the tint of many coloring matters—thus, they turn litmus, reddened by an acid, into blue; turmeric, brown; and syrup of violets or an infusion of red cabbages, green. The alkalies are hydrates, or water in which half the hydrogen is replaced by a metal or substance acting like a metal.

Alkali soils, such as are common in the western regions of America, are those in which salts occur in sufficient quantity to interfere with fertility. Black alkali soils are the least fertile, but a mixture of gypsum and calcium sulphate applied to such a soil helps overcome its weakness. Soluble salts are sometimes brought up from lower depths by means of irrigation, and good soil is thereby rendered alkali. In such a case the salts should be removed by drainage. See SOIL.

AL'KALOID, a class of chemical compounds found in living plants usually in combination with other substances. An alkaloid will combine with an acid to form a salt, and is therefore a *base* (which see). The names of alkaloids end usually in *ine,* as morphine, quinine, caffeine, etc. Among them are the strongest poisons and the most powerful medical remedies known. Nearly all injure the nervous system if taken in too large quantities; no one should ever take an alkaloid except when it is prescribed by a trustworthy physician. Most natural alkaloids contain carbon, hydrogen, nitrogen and oxygen; when oxygen is lacking the alkaloid is liquid in form.

AL'LAH, in Arabic, the name of God, a word of kindred origin with the Hebrew word *Elohim.* "Allah Akbar" (God is great) is a Mohammedan war cry.

ALLAHABAD, *ahl'lah hah bahd',* a word meaning *city of God,* is an ancient city of India, capital of the Northwest Provinces. Allahabad is one of the chief resorts of Hindu pilgrims, who come to have their sins washed away by bathing in the waters of the sacred rivers Ganges and Jumma, which unite at this point. It is also the scene of a great fair in December and January. The town is poorly built, but contains some remarkable buildings, of which the best examples are the great mosque, or Jumma Musjid, the palace of the sultan and the great citadel of Akbar. This citadel is the center of the fort of Allahabad, one of the chief strongholds of British India. The city is situated in the midst of an agricultural district and forms the center of a large trade, the chief products being cotton, indigo and sugar. The town is as old as the third century B. C. From 1765 to the beginning of the nineteenth century it suffered from change of rulers, but finally came under British rule. In the mutiny of 1857 it was the scene of a serious outbreak and massacre. Population, 1911, 171,697.

ALLAN, HUGH, Sir (1810–1882), a Canadian financier and shipowner, born at Saltcoats, Ayrshire, Scotland. Emigrating to Canada at the age of sixteen, he soon entered the employ of the principal shipbuilding and grain-shipping firm of Montreal, of which he became a junior partner in 1835. In 1853 he organized the Allan Line of steamships and until his death he was intimately connected with the growth and commercial prosperity of Canada. He was one of the original promoters of the Canadian Pacific Railway, but the company, which had already received a charter, was dissolved as the result of disclosures with reference to political influence.

ALLAN, HUGH MONTAGU, Sir (1860–), a Canadian business man, born in Montreal. He was educated at Bishop's College, Lennoxville, Quebec, and in Paris, France. He was created a Knight Bachelor by His Majesty King Edward VII in 1904 and made a Commander of the Victorian Order in 1906. Sir Hugh is vice-chairman of the Allan Line Steamship Company and a director in many other corporations.

ALLEGHANY, *al le ga'ny,* **MOUNTAINS**, a name sometimes used as synonymous with *Appalachians,* but also often restricted to the mountains that traverse the states of Virginia, Maryland and Pennsylvania from southwest to northeast. They consist of a series of parallel ridges, for the most part wooded to the summit, with some fertile valleys between. Their mean elevation is about 2,500 feet, but in Virginia they rise to over 4,000. The Alleghanies are remarkable in that they contain the richest coal mines in the United States. See BLUE RIDGE; CUMBERLAND MOUNTAINS.

ALLEGHENY, a river rising in Pennsylvania and flowing into New York, then back into Pennsylvania, uniting with the Monon-

gahela at Pittsburgh to form the Ohio. It is 325 miles long and is navigable for 200 miles above Pittsburgh.

AL'LEGORY. An allegory is a story told not for its own sake but for the purpose of presenting in a clear and interesting manner some abstract thought. To be complete, each character in the narrative should represent some quality, and the relation of the characters and the outcome of the narrative show the interaction of various qualities on one another. The most famous of English allegories is Bunyan's *Pilgrim's Progress.* Tennyson's *Idylls of the King* is one of the best of many allegories not wholly symbolic.

AL'LEN, ETHAN (1737–1789), an American soldier, leader of the Green Mountain Boys in the capture of Fort Ticonderoga. He was born in Litchfield, Conn., but about 1763 settled near Bennington, Vt. In 1775, after the Battle of Lexington, the condition of Fort Ticonderoga attracted the attention of the patriots, and Allen and Benedict Arnold both were eager to effect its capture. The Green Mountain Boys, with Allen, reached Lake George before Arnold overtook them, and on May 10, 1775, when but a part of his men had as yet crossed the lake, Allen rushed into the fort and captured it by ordering the commander to surrender, "in the name of the Great Jehovah and the Continental Congress!"

After this Allen went to Philadelphia, where he received the thanks of Congress for his services. He was sent on a secret mission to Canada to learn the views of the Canadians as to rebellion, and accompanied Montgomery's expedition. In an adventure at Montreal he was captured and sent to England, but was returned to America, where he was confined in prison-ships. On obtaining his freedom Allen was appointed lieutenant-colonel of the Vermont militia and was sent as an agent to Congress to secure the admission of Vermont to the Confederation. Congress hesitated, and the British commanders endeavored to persuade Allen to restore the authority of the Crown. He was accused of treason, but it is believed that his relations with the British were all entered into for the sake of advancing the cause of the colonies. After the Revolution Allen lived in retirement and wrote a book on natural religion, entitled *Reason the Only Oracle of Man.* See GREEN MOUNTAIN BOYS.

ALLEN, GRANT (CHARLES GRANT BLAIRFINDIE), (1848–1899), a Canadian author, born at Kingston, Ontario. He was educated in America and France and later at King Edward's School, Birmingham, and at Merton College, Oxford. He was a voluminous writer on scientific subjects, which he treated in popular fashion, but is best known as the author of numerous novels and books of travel.

ALLEN, JAMES LANE (1849–), an American novelist who has won popularity as a writer of Southern stories. He was born near Lexington, Ky., and most of his narratives have a Kentucky setting. He graduated at Transylvania University, and after teaching at Kentucky University became a professor of Latin and higher English at Bethany College, W. Va. After 1886 he lived in New York. His works show artistic finish and knowledge of human nature. Among them are *The Choir Invisible, A Kentucky Cardinal, The Reign of Law, The Mettle of the Pasture, The Last Christmas Tree, The Sword of Youth* (1915) and *The Kentucky Warbler* (1918). Among his best short stories are *The White Cowl* and *Sister Dolorosa.*

JAMES LANE ALLEN

ALLENTOWN, PA. the county-seat of Lehigh County, fifty-six miles northwest of Philadelphia, on the Lehigh River and on the Philadelphia & Reading, the Lehigh Valley and the Central of New Jersey railroads. The city is on high ground in a fertile region and has extensive iron and steel works. It is second only to Paterson, N. J., in the production of American silks, having more than twenty silk mills. Other products of note are furniture, wire, motors and trucks, hosiery and shoes. The population is mostly of German descent. The city has a fine hospital, is the seat of Muhlenberg College (Lutheran) and of the Allentown College for Women. The place was laid out about 1752 by William Allen, then the chief justice of Pennsylvania. In 1811 it was incorporated as the borough of Northampton, but the original name was restored in 1838. The city has the commission form of government, adopted in 1913.

Population, 1910, 52,913; in 1917, 65,109 (Federal estimate).

ALLI'ANCE, O., settled in 1838 and called Freedom until 1850, is a city in Stark County, fifty-five miles southeast of Cleveland and nineteen miles northeast of Canton, the county seat. It became a city in 1889. Transportation is furnished by the Pennsylvania and the New York Central and minor railroads. The city has nearly sixty acres of parks and Mount Union College (Methodist). It is in a fine agricultural region and has extensive manufactures, including iron, agricultural implements, terra cotta ware and white lead. Population, 1910, 15,083; in 1917, 19,581 (Federal estimate).

AL'LIGATOR, a large reptile resembling the crocodile, dwelling in waters of tropical regions of the western hemisphere, where it frequents swamps and marshes and may be seen during the day basking on the ground in the heat of the sun. Alligators are slow in growth and when fifteen years of age are not more than two feet long. Nearly a hundred years are required for them to reach their full length of sixteen feet. They are active animals, and they prey upon whatever game comes their way. Whenever they have captured an animal, they take it into the water and eat below the surface. They are rather timid, in spite of their size, but defend themselves viciously if attacked; on shore they rush with open mouth at their enemies and thrash their powerful tails from side to side. The young are hatched by the sun from eggs, of which the female lays 200 or more in great heaps of vegetable matter.

The alligators of South America were very often called *caymans.* One species is known as the *spectacled cayman,* because of the high bony rim surrounding the orbit of each eye. In the United States the alligator is not often seen north of Florida, but at one time it was not uncommon from North Carolina to the Gulf of Mexico. There are several alligator "farms" in Florida. Millions have been killed for sport and because of their hide and ivory. The flesh of the alligator is often eaten, and the leather made from its hide is beautiful and costly. See CROCODILE.

ALLIGATOR PEAR, the fruit of an evergreen tree. It resembles a large pear, is one to two pounds in weight, and has a firm, marrow-like pulp of a delicate flavor. It is called also *avocado pear* or *vegetable butter.* The plant is a native of tropical regions, and is cultivated in Florida, California and Hawaii.

ALLIGATOR PEAR
a, fruit; b, flower; c, longitudinal section of fruit.

AL'LISON, WILLIAM BOYD (1829–1908), an American statesman, one of the framers of the Bland-Allison silver bill of 1878. He was born at Perry, Ohio, was educated at Allegheny College, Pa., and at Western Reserve College, Ohio. He practiced law in Ohio until 1857, when he removed to Dubuque, Iowa. Allison served in Congress as a Republican from 1863 to 1871. In 1873 he was elected to the United States Senate, being five times reëlected. With Richard P. Bland he wrote the bill which provided for the purchase of silver bullion and the coinage of a certain number of silver dollars each month, and he took a prominent part in the discussion and amendment of the so-called railroad rate bill in 1906. Senator Allison was several times a prominent candidate for the Republican nomination for the Presidency,

WILLIAM B. ALLISON

and was always one of the party's influential leaders.

ALLITERA'TION, the repetition of the same letter or sound at the beginning of two or more words immediately succeeding each other, or at short intervals. It is a commonly used device in poetry, but studied use of alliteration is not considered good form in prose. The following are typical examples of poetical alliteration:

Behold the merry minstrels of the morn
The swarming songsters of the careless grove.
I sigh the lack of many a thing I sought,
And with old woes new wail my dear time's waste.
Sublimely mild, a Spirit without a spot.

In the ancient German and Scandinavian and in early English poetry, alliteration took the place of terminal rhymes, the alliterative syllables being made to recur with a certain regularity in the same position in successive verses. The following illustration is from the Anglo-Saxon poem, *Beowulf*: "*Flot*a *fâmig*-heals *fug*le gelîcost." (The *float*er *foamy*-necked, to a *fowl* most like.)

ALLOP'ATHY, the name applied by homeopathists to systems of medicine other than their own. Hahnemann's principle being that "like cures like," he called his own system *homeopathy*, and other systems *allopathy*. *Allopathy* is derived from the Greek words for *other* and *disease*. See HOMEOPATHY.

ALLOT'ROPY. Under special conditions many of the chemical elements have such totally different habits and properties that they appear to be entirely different substances. For instance, sulphur as usually seen is a light yellow, opaque, solid substance that breaks easily and is readily dissolved by carbon disulphide. Under other conditions it appears to be an entirely different thing—a translucent, amber-colored substance, soft and elastic like rubber and insoluble in carbon disulphide. It is, however, still sulphur, and nothing else. Again, phosphorus under some conditions is a dark reddish-brown powder resembling chocolate, and non-poisonous; under others, it is colorless, translucent and wax-like, melting and even taking fire at a very low temperature, and is extremely poisonous. Yet in both conditions phosphorus is phosphorus. This property of appearing in different forms is known in chemistry as allotropy, and one form is said to be anallotropic modification of the other. It is really a special case of polymerism. See POLYMERISM.

ALLOY, *al loi'*, sometimes a chemical compound, but more generally merely a mechanical mixture produced by melting together two or more metals. Printers' types are made from an alloy of lead and antimony; brass and a number of other alloys are formed from copper and zinc; bronze from copper and tin. Most metals mix together in all proportions, but others unite only in definite proportions, and form true chemical compounds. Others again resist combination, and when fused together form a conglomerate of distinct masses. The changes produced in their physical properties by the combination of metals are various. Their hardness is in general increased, but they resist any effort to hammer them into a sheet or stretch them into a wire. The color of an alloy may be scarcely different from that of one of its components, or it may show traces of neither of the two. Its specific gravity is sometimes less than the average of that of its component metals.

Alloys are always more fusible than the metal most difficult to melt that enters into their composition, and generally even more so than the most easily melted one. Newton's fusible metal, composed of three parts of tin, two or five parts of lead and five or eight parts of bismuth, melts at temperatures varying from 198° to 210° F. and therefore in boiling water; its components fuse respectively at the temperatures 442°, 600° and 478° F. In some alloys, however, each metal retains its own fusing point (which see).

ALL-SAINTS' DAY, a festival of the Christian Church, instituted in 835, and celebrated on November 1. It owes its origin to the fact that it was impossible to set aside a separate day for every saint. See HALLOW-EVEN.

ALL-SOULS' DAY, a festival of the Catholic Church, instituted in 998 and observed on November 2. Its object is the relief, by prayers and acts of charity, of the souls in purgatory.

ALL'SPICE is the dried berry of the pimento, a West Indian species of myrtle, a beautiful tree with white and fragrant aromatic flowers and shiny leaves of a deep green. The name comes from the fact that allspice is thought to resemble in flavor a mixture of cinnamon, nutmegs and cloves. The fruit is also called Jamaica pepper. It is employed in cooking, and in medicine as

an agreeable aromatic, and it forms the basis of a distilled water and an essential oil.

ALLSTON, WASHINGTON (1779–1843), an American painter, sometimes called the "American Titian." He was born at Waccamaw, S. C. After graduating from Harvard in 1800, Allston went to Charleston and there began active work in art. The next year he went abroad and visited London, Paris and Rome, where he spent his time studying the works of the great masters. In style he imitated the Venetian School. His more important works are *The Dead Man Revived, Uriel in the Sun, The Prophet Jeremiah* and *Belshazzar's Feast.*

ALLU'VIUM, deposits of soil, collected by the action of water, such as are found in valleys and plains. Alluvium consists of loam, clay and gravel, washed down from the higher grounds. Deposits are found along the banks of nearly all streams of considerable size, and they constitute the deltas formed by the Nile, the Po, the Mississippi and other large rivers. The large tracts of fertile land found along the lower courses of these and other rivers are also formed by alluvial deposits, as are most flood plains.

Related Articles. Consult the following titles for additional information:
Delta
Erosion
Flood Plain
River

ALMA MATER, *al'ma may'tur,* a Latin phrase meaning *fostering mother.* The term was originally applied by the Romans to Ceres, the goddess of agriculture, to Cybele, the goddess of earth, and to other deities. Because a college or university is figuratively a "fostering mother" the words have been for many years applied to such institutions. Thus, a graduate will speak of Harvard or Michigan as his "alma mater."

AL'MANAC, a book or table in which are given a calendar, the time of the rising and setting of the sun, the phases of the moon, and the most remarkable positions and phenomena of the heavenly bodies, for every month and day of the year; also the several fasts and feasts to be observed in the church and state, the terms of courts and often much miscellaneous information likely to be useful to the public. In England almanacs have been known from the fourteenth century, and there are several English almanacs of that century existing in manuscript form. They became generally used in Europe within a short time after the invention of printing.

Formerly the immense popularity of almanacs was due to the mass of astrological predictions with which they were filled, and the effect of these guesses at the future was often so bad that in France it was necessary to prohibit, at various times, the publication of prophetic almanacs. The most famous English almanac was *Poor Robin's Almanack,* which was published from 1663 to 1775, and which was an incredible mixture of ignorance and imposture. In 1828 the Society for the Diffusion of Useful Knowledge, by publishing the *British Almanac,* took the lead in the production of an almanac containing genuine information, and by contrast showed the fraudulent nature of the information which had been furnished in the earlier almanacs. Even to the present day there are published in Great Britain almanacs containing astrological predictions, but they are not taken seriously, even by the ignorant classes.

The most famous of the popular almanacs which have been published in the United States was *Poor Richard's Almanac,* begun by Franklin in 1732 and continued for twenty-five years. Now the publication of good almanacs is in America confined almost entirely to large newspaper houses.

The *Nautical Almanac and American Ephemeris,* published annually by the United States bureau of navigation, embraces all the elements necessary for determining at any time the absolute and relative places of the sun, moon and seven principal planets and of many of the fixed stars, as well as several different series of phenomena for the determination of longitudes and latitudes, the distances of the moon from fixed stars and from planets and the time for the occurrence of eclipses. To these are added rules and tables for practical use in nautical astronomy, land observations and tables of tides. It is a text-book for the navigator, and no sailor leaves the American shore without it. The computations are made three years in advance and could be made still farther if necessary, but no cruise is made which lasts longer than that time. Similar publications are issued by the German, French and English nations.

ALMANDINE, *al' man din,* the name given to two precious stones. One, red in color and transparent, is a variety of garnet. When cut with a convex face a gem of this variety is called a *carbuncle.* The other

is a variety of Spinel ruby and is violet in color. Both varieties are beautiful gems for setting.

ALMA-TADEMA, *ahl'ma tahd'e ma,* LAWRENCE (1836–1912), a Dutch painter, born in Friesland, but long a resident of England. In 1879 he became a Royal academician and was later made a member of various foreign academies. He is especially celebrated for his pictures of ancient Roman, Greek and Egyptian life, which are painted with great realism and archaeological correctness. Some of his best known pictures are *Reading from Homer, At the Shrine of Venus, The Four Seasons* and *Antony and Cleopatra.*

ALMOND, *ah'mund,* the fruit of the almond, a tree which grows usually to the height of twenty feet, and is akin to the

ALMOND
Branch, blossom and fruit.

peach and nectarine. It has beautiful pinkish flowers that appear before the leaves, which are oval, pointed and delicately serrated. The almond is a native of Africa and Asia, now naturalized in southern Europe, and cultivated in England for its beauty and in California for its fruit. The fruit has a downy outer coat which covers the flattish, wrinkled stone that encloses the seed. There are two varieties, one sweet and the other bitter. Sweet almonds are a delicious food and furnish an oil used in flavoring. Bitter almonds contain prussic acid, a highly poisonous substance.

ALOE, *al'o,* a genus of plants, some of which are not more than a few inches tall, while others reach a height of thirty feet and more. They are natives of Africa and other hot regions and have fleshy leaves, which are thick and more or less armed with spines at the edges or ends. The flowers have a tubular

ALOE

corolla. The fibrous parts of the leaves of some species are made into cordage, fishing nets, lines and cloth; the juice of several species is used in medicine as a bitter drug; under the name of *aloes.* The principal drug-producing species are the Socotrine aloe, the Barbadoes aloe and the Cape aloe. A beautiful violet color is afforded by the leaves of the Socotrine aloe. The so-called American aloe is a different plant altogether (see AGAVE), as are also the aloes or lign-aloes of Scripture.

ALOES WOOD, *al'oze wood,* or **EAGLE WOOD,** the inner portion of the trunk of forest trees found in tropical Asia. They yield a fragrant resinous substance, which, like the wood, is burned for its perfume. Aloes wood is hard and fine-grained, takes a high polish and is highly prized for ornamental work. Another tree also produces aloes wood. This wood is supposed to be the lign-aloes of the Bible, and Herodotus

says that it was sold for its weight in gold.

ALPAC'A, a cud-chewing animal of the camel tribe, a native of the Andes, especially of the mountains of Chile and Peru, and so closely allied to the llama that by some it is regarded rather as a smaller variety than a

ALPACA

distinct species. It has been domesticated, and remains also in a wild state. In form and size the alpaca approaches the sheep, but it has a longer neck. It is valued chiefly for its long, soft and silky wool, which is straighter than that of the sheep, and very strong. The wool is woven into fabrics of great beauty. All of these are known as *alpaca,* and they are used for shawls, clothing for warm climates, coat-linings and umbrellas. The flesh of the alpaca is pleasant to eat and is wholesome. See LLAMA.

ALPE'NA, MICH., settled in 1835 and incorporated in 1871, is the county seat of Alpena County, on the Detroit & Mackinaw Railroad and on Thunder Bay, an arm of Lake Huron. It is in a region of lakes, and the neighborhood attracts summer visitors. The industries include the extensive manufacture of cement, which has given the town the name of THE CEMENT CITY; the output is nearly 200,000 tons a year. There is also a paper mill and a leather factory. The city adopted the commission form of government, effective in 1916. There is a public library and a hospital. Population, 1910, 12,706; in 1917, 13,365 (Federal estimate).

ALPHA, *al'fah,* and **OME'GA**, the first and last letters of the Greek alphabet, sometimes used to signify completeness. They are also used as a symbol of God. They were formerly the emblem of Christianity and were engraved on the tombs of the early Christians.

ALPHABET, *al'fa bet,* (from *Alpha* and *Beta,* the first two letters of the Greek alphabet), the series of characters used in writing a language, and intended to represent the sounds of which it consists. The English alphabet, like all those of modern Europe except the Russian, is derived directly from the Latin, the Latin from the ancient Greek and that from the Phoenician, which again is believed to have had its origin in the Egyptian hieroglyphics. The Hebrew alphabet probably had practically the same origin, and the names of the letters in Phoenician and Hebrew must have been almost the same, for the Greek names, which, with the letters, were borrowed from the former, differ little from the Hebrew.

By means of the names we may trace the process by which the Egyptian characters were transformed into letters by the Phoenicians. An Egyptian character, for example, recalled by its form the idea of a house, in Phoenician or Hebrew, *beth,* and the character itself was given the name *beth.* This character would subsequently come to be used wherever the sound *b* occurred. Its form was afterward simplified and modified, but the name still remains, *beth* being still the Hebrew name for *b,* and *beta* the Greek. Our letter *m,* which in Hebrew was called *mim,* water, has still a resemblance to the zigzag, wavy line which by the Egyptians was used to represent water. The letter *o,* of which the Hebrew name means *eye,* was no doubt originally intended to represent that organ.

The Greek alphabet originally possessed only sixteen letters, though the Phoenician had twenty-two; the original Latin, as it is found in the oldest inscriptions, consisted of twenty-one letters, and the German has the same letters as the English, although the sounds of some of them are different. The Sanskrit alphabet is one of the most remarkable in the world. As now used it has fourteen characters for the vowels and diphthongs and thirty-three for the consonants besides two other symbols. Our alphabet is an imperfect instrument, since, in the first place, it has not a character for every sound, and in the second place, it has letters which are superfluous, because there are other letters which represent the same sounds. Thus *a* may stand for any one of eight sounds,

while *c* is unnecessary because its two sounds are represented by *k* and *s*. An alphabet is not essential to the writing of a language, since symbols may be used instead, as in Chinese.

There is a remarkable Indian alphabet which was invented by Seequoyah of the Cherokee tribe. In his first attempts at alphabet-making he tried to represent the sounds of the Cherokee language by pictorial signs, using images of birds and beasts, but he soon gave this up and used instead such arbitrary signs as he thought would be most easily remembered. At first he used over 200 characters, but these were later reduced to 86. The United States government became interested in his discovery, had a font of type cut for his alphabet, and a newspaper, *The Cherokee Phoenix*, was printed partly in Cherokee and partly in English.

ALPS, the highest and most extensive mountain chain in Europe, forming the watershed between the river systems of the Mediterranean Sea and the Atlantic Ocean. The Alps are celebrated for the beauty of their scenery, and are visited by tourists from all over the world. The chain covers parts of five countries: portions of Northern Italy, Southeastern France, Southern Germany, Western Austria-Hungary and most of Switzerland. Several important rivers of Europe take their rise in the Alpine valleys, the largest being the Rhine and the Rhône. The range is about 660 miles long and from ninety to 180 miles wide. Its average height is about 7,700 feet, the highest peaks being Mont Blanc, 15,781 feet, on the Franco-Italian border, and Monte Rosa, 15,217, in Switzerland. The system of ranges is now commonly grouped under Eastern, Western and Central Alps.

The general form of the Alps is that of a crescent; from the principal chains spurs extend to the Apennines, the Vosges, the Harz, the Balkans and the Carpathians. The higher Alps are covered with perpetual snow and from the peaks there descend to the valleys below great glaciers, enormous masses of partially-melted snow and pulverized ice, constantly augmented by the masses from behind, which acquire a moving force that nothing can resist. Finally they reach a point where the sun melts them, and they become the sources of mountain rivers. The largest glacier, the *Mer de Glace*, on the northern slope of Mont Blanc, is fifteen miles long, three to six miles wide and eighty to 120 feet thick. The Rhône Glacier is one of the most famous. The Helvetian Alps in Western Switzerland, on both sides of the Rhône, are the portion most visited, and they afford the most beautiful mountain scenery of Europe. Among their peaks are the Jungfrau and the Finsteraarhorn.

The Alps were formerly considered well-nigh impassable, and Hannibal's famous passage was reckoned one of his greatest feats. There are now good roads over most of the passes, some of which, however, are exceedingly dangerous. The chief passes connect Switzerland and France with Italy. One of the first famous roads was that built by Napoleon, 1803–1810, over Mont Cenis, at a height of 6,773 feet. The Mont Cenis tunnel, connecting France and Italy, is fourteen miles from this road. The celebrated Saint Gotthard pass is 6,935 feet high, and has been crossed by a carriage road since 1823. The great tunnel of Saint Gotthard, connecting Luzerne and Milan, is near this pass. Other famous passes are the Col de Balme, celebrated for its view of Mont Blanc, the Little Saint Bernard, one of the oldest and easiest, and the Great Saint Bernard, famed for its inn and dogs.

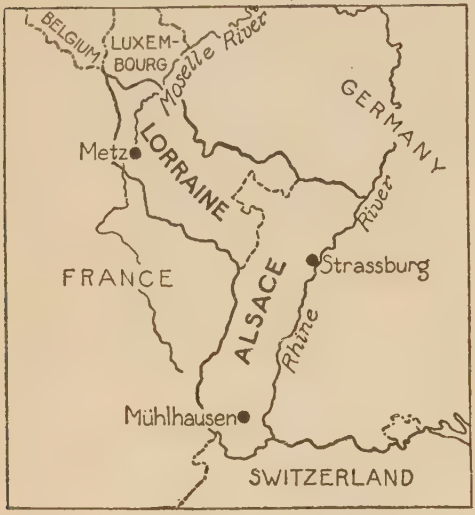
Owing to the great height of the Alps, their vegetation is remarkably varied. At 6,500 feet all the vegetation of the plains has disappeared, including maize, cereals, common fruit, and forest trees. Between 7,500 and 8,500 feet a very rich pasturage and the peculiar Alpine flora appear. Animal life in many forms is abundant, and peculiar to Alpine regions are the chamois and the mountain goat.

Related Articles. Consult the following titles for additional information:
Cenis, Mont
Jungfrau
Matterhorn
Mer de Glace
Mont Blanc
Mont Cenis Tunnel
Rosa, Monte
Saint Gotthard Tunnel

ALSACE-LORRAINE, *al sahs' lor rayn'*, until 1918 an imperial territory of the former German Empire, lying east of France. Its length from north to south is 123 miles; its width varies from twenty-two to 105 miles, and its area is 5,603 square miles, or about one-eighth more than that of the state of Connecticut. Alsace-Lorraine was forcibly taken from France at the close of the Franco-German War, and its cession was a cause of bitter sorrow to the French people. The question of ceding the territory back to France

was settled affirmatively long before the close of the World War.

The eastern portion is a plain sloping toward the Rhine and containing occasional marshes and swamps, while the western portion is traversed by the Vosges Mountains, which rise in places to a height of 4,700 feet. The mountains contain valuable deposits of iron and coal, and Alsace-Lorraine has become the leading iron-producing country of the Empire. Fruit culture also is extensive in the mountain regions, and grapes are largely cultivated. In its manufacturing in-



ALSACE-LORRAINE

The two provinces were a part of the German Empire from 1870 to 1918, when they were returned to France.

terests, also, Alsace-Lorraine is one of the most important territories of the Empire. The leading manufactures are cotton, woolen and silk goods and iron products, including pig iron, machinery and tools. While the manufacture of cloth is carried on in large factories in the cities, throughout the country much cloth is still woven in the homes and on hand looms. Good roads, numerous railways and canals and telegraph and telephone lines traverse the country, making transportation and communication convenient and cheap. The important towns are Strassburg, the capital, Metz, Mülhausen and Kolmar.

History. In the fourth and fifth centuries Alsace-Lorraine was brought under the control of the German tribes. Later it passed to the Franks, but was regained by the Germans in the tenth century. In the sixteenth century it again came under the control of the French, and at the peace of Westphalia, in 1648, the Hapsburgs ceded their territory in Alsace to France. Louis XIV seized the free cities Strassburg and Kolmar, and his right to them was confirmed by the Treaty of Ryswick in 1697.

At the close of the Franco-German War in 1871 Germany demanded as a condition of peace that Alsace and about one-third of Lorraine be ceded back, and France was obliged to yield, although the inhabitants of the ceded territory were almost universally opposed to becoming German subjects. So strong was this opposition that for some time local government was almost at a standstill, as those who were elected to office refused to take the oath of allegiance to the German Empire. In 1872 the emperor compelled the inhabitants to declare themselves either French or German citizens, and of the 150,000 who declared for France about one-third removed to French territory. Population, 1910, 1,874,014.

Related Articles. Consult the following titles for additional information:
France (History) Germany (History)
Franco-German War World War

ALTAI, *al'ti,* **MOUNTAINS,** an important Asiatic system on the borders of Siberia and Mongolia, are partly in Russian and partly in Chinese territory. The highest summit, Byeluka, or White Mountain, is 11,000 feet in altitude. Geologically the Altai are among the oldest mountains of Asia; their summits have been worn and rounded; their lower slopes are covered with grass and their higher slopes are clothed with forests which extend nearly to their summits. The Altai are exceedingly rich in minerals, including gold, silver, copper and iron, and within the Russian provinces mining has become an important industry.

ALTDORF, *ahlt'orf,* or **ALTORF,** SWITZERLAND, capital of the canton of Uri. It is beautifully situated near the Lake of Lucerne, amid gardens and orchards, and is memorable as the place where, according to legend, William Tell shot the apple from his son's head. A colossal statue of Tell now stands here. Population, about 3,800.

ALTGELD, *ahlt'geld,* JOHN PETER (1847–1902), an American politician, born in Germany. He entered the Union army in 1863 and fought until the close of the war. Later

he began the study of law and was admitted to the bar. He was at one time judge of the superior court in Chicago, and from 1893 to 1897 was governor of the state of Illinois, gaining notoriety by his pardon of several of the anarchists connected with the Haymarket riots. He was active in support of Bryan in two of his Presidential campaigns, and was a popular public speaker and the author of several books on social and political questions.

ALTON, ILL., settled in 1783 and incorporated in 1835, is a city in Madison County, on the Mississippi River. It is built on bluffs 200 feet above the water, which fact gives it the name THE BLUFF CITY. The Chicago & Alton Railroad was built to Alton in 1867, the Cleveland, Cincinnati, Chicago & Saint Louis in 1879, and the Illinois Terminal in 1900.

Glass, lead, cartridges and boxboard paper are the leading manufactures; these and the Standard Oil Company employ over 5,000 men. There are two national banks and three state banks. Important institutions are the Cathedral of Saints Peter and Paul, an Ursuline Convent and Thayer Memorial Library. Shurtleff College is two miles distant, at Upper Alton. A monument to Elijah P. Lovejoy, the first martyr in the events preceding the Civil War, stands in the city. He was killed here by an anti-abolition mob in 1837. Population, 1910, 17,528; in 1917, 23,783 (Federal estimate).

ALTONA, *ahl'to na*, GERMANY, an important commercial city in the Prussian province of Schleswig-Holstein, adjoining Hamburg, with which it virtually forms one city. It is a free port, and its commerce, both inland and foreign, is large, being identified with that of Hamburg. Population in 1910, 172,628.

ALTOO'NA, PA., a city in the center of the state, 117 miles east of Pittsburgh and 237 miles northeast of Philadelphia, and situated 1,180 feet above sea level. It is five miles east of the scenic horseshoe bend on the Pennsylvania Railroad; that road serves the city. Altoona's growth is in good measure due to the location in the city of the great railroad shops of the Pennsylvania Company, employing over 16,000 men. The country on all sides is rich in coal, and coal mining adds to the importance of the town.

The city has over fifty churches, a mechanics' library for railroad shop employees, a public library and two large hospitals. Population, 1910, 52,127; in 1917, 59,712 (Federal estimate).

ALTO-RILIEVO, *ahl'to re lya'vo*, (high relief), is the term applied to sculptured figures to express the fact that they stand out boldly from the background. A figure to be in high relief should actually stand out more than one-half its thickness from the background without being entirely detached. See BAS-RELIEF; MEZZO-RILIEVO.

ALTRUISM, in ethics, the theory of conduct which holds that the individual should subordinate and sacrifice himself to the welfare of society. The word was coined by the French philosopher Comte from the Latin word *alter*, meaning *the other* (of two). The theory as stated by Comte was developed by Herbert Spencer, who applied the principles of physical evolution to society and showed that in a perfect society the individual must take part in securing the well-being of others. Pure altruism is impossible, because the theory implies that the individual secures his own happiness in the happiness of others. Thus he is an egoist to the extent that he achieves happiness for himself (see EGOISM). In other words, altruism is to be considered as a means rather than an end. In common speech, altruism refers loosely to any actions which may result in the welfare of others, whatever the motives may be which have prompted those actions, or whatever the consequences to the doer.

AL'UM, a name for a class of salts formed by crystallization from a mixture of aluminum sulphate and an alkaline sulphate. They are known as potassium alum, ammonium alum, sodium alum, etc. Alums will dissolve in water, and the resulting solution has a sweetish, puckery taste. When heated, alum crystals form a white, powdery mass called burnt alum, which is used in medicine. The alum formerly used somewhat generally as an adulterate of baking powders is sodium alum; such use is now illegal. Alums are also utilized in dyeing and printing cloth, in tanning and the manufacture of paper, in purifying water and sewage, for hardening plaster and in the preparation of other aluminum compounds.

ALU'MINA, the single oxide of the metal aluminum, which, when combined with silica, is one of the most widely distributed substances. It enters in large quantity into the

composition of granite, traps, slates, schists, clays, loams and other rocks. The porcelain clays and kaolins contain about half their weight of this earth, to which they owe their most valuable properties. It has a strong affinity for coloring matters, which causes it to be employed in the preparation of the colors called lakes, used in dyeing and calico printing. It combines with the acids and forms numerous salts, the most important of which are the sulphate and acetate, the latter of extensive use as a mordant. In its native state alumina is called corundum. When crystallized it appears as ruby or sapphire.

Related Articles. Consult the following titles for additional information:

Emery
Corundum
Ruby
Sapphire
Topaz

ALU'MINUM, or **ALUMIN'IUM**, a bluish-white metal discovered in 1827, and next to silicon and oxygen the most widely distributed element in the earth's crust. Aluminum is a little more than two and one-half times heavier than water. It does not tarnish when exposed to the air, is very ductile and malleable and is the most sonorous of all metals. It melts at 1160°F. It is nowhere found native, but is the basis of clay, which is its oxide.

Uses. The uses of aluminum are rapidly increasing. It is a good conductor of electricity and because of its lightness takes the place of copper occasionally in the construction of electric lines. One of its most important uses is in the manufacture of steel, since the addition of a small quantity of aluminum greatly improves the quality of the steel. It is also used in the manufacture of numerous household utensils, for which it is especially suited, since it is light, durable and is not easily acted upon by acids. Smaller articles, like hairpins, thimbles, combs, etc., are frequently made of it. There are numerous alloys of aluminum and other metals, such as aluminum bronze, an alloy with copper, and magnalium, an alloy with magnesium. Most of these alloys take a high polish and are valuable for ornamental work. Other alloys are utilized in the manufacture of aeroplanes, boats and automobiles. Aluminum gold, which is a compound of aluminum and copper closely resembling gold, is often used in the manufacture of watch cases and cheap jewelry. While it is bright when new, it soon tarnishes and is almost worthless for ordinary purposes.

Manufacture. Because of the difficulty in separating aluminum from its compounds it is only recently that it has been obtained in such quantities as to bring it into practical use. It is now obtained from bauxite (see BAUXITE) by subjecting this mineral to the heat of the electric arc. The operation is carried on in furnaces constructed specially for the purpose. The furnace is practically a huge crucible made of blocks of carbon. In the bottom of the crucible is a small tap-hole, where the melted aluminum may be drawn out.

The positive electrode is constructed of heavy carbon plates so as to form a prism. This is attached to a chain and a derrick so it can be lowered into the crucible as fast as the end burns off. Before the process begins, pieces of copper are thrown into the crucible to form the negative electrode. The bauxite is shoveled in through openings made for the purpose. When the electric circuit is completed, a terrific heat is produced which causes the bauxite to give up its aluminum. This runs down to the bottom of the crucible and is drawn off through the tap-hole. The bauxite is fed into the crucible as fast as it is reduced, and the process continues until the carbon electrode has been entirely consumed. An ordinary furnace will produce about 400 pounds in twenty-four hours. Aluminum smelters are located at Niagara Falls, Pittsburgh, Pa., and Shawinigan Falls, Que.

When first prepared for commercial use aluminum sold for $90 per pound, a price which made its wide employment impossible. Through perfected methods of manufacture the price fell within a year to $2 per pound, and later to twenty to thirty cents.

AL'UM ROOT, the name given in America to two plants on account of the remarkable astringency of their roots, which are used for medical purposes. One of these plants belongs to the geranium group, and the other to the saxifrage family. The tincture of the root of the former is used to cure sore throat and mouth ulcerations. The root of the latter has been found valuable in the preparation of a wash for wounds and ulcers.

ALVA, *ahl'vah*, or **ALBA**, FERDINAND ALVAREZ DE TOLEDO, Duke of (1508–1582), a Spanish statesman and general under Charles V and Philip II. He is remembered chiefly for his bloody and tyrannical government of the Netherlands, which had revolted,

and which he was commissioned by Philip II to reduce to entire subjection.

Among his first proceedings was the establishment of the "Council of Blood," a tribunal which condemned all whose opinions were suspected and whose riches were coveted. Many merchants and mechanics emigrated to England. The counts Egmont and Horn and other men of rank were executed, and William and Louis of Orange had to flee to Germany to save themselves. Resistance was quelled for a time, but the provinces of Holland and Zealand soon revolted against his tyranny. A fleet which was fitted out at his command was annihilated, and he was everywhere met with insuperable courage. He was recalled, and in 1573 he left the country in which, as he boasted, he had executed eighteen thousand men. He was received with distinction in Madrid. Before his death he reduced all Portugal to subjection to his sovereign.

AL'VERSTONE, Lord (formerly Sir Richard Webster, 1842–1915), a distinguished English jurist. He was formerly attorney-general of the United Kingdom and British counsel in the Venezuela Dispute. From 1900 to 1913 he was chief justice of England. In 1903 Lord Alverstone was president of the Alaska boundary commission, and voted with the representatives of the United States, in opposition to the claims of Canada.

LORD ALVERSTONE

AMAL'GAM, an alloy or mixture of mercury and some other metal. The principal amalgams are with gold, silver, tin and copper. These alloys are most commonly formed by bringing mercury into contact with the other metal. In metallurgy mercury is used to extract free gold and silver from their ores because of its power of uniting with these metals. Tin amalgam is used for silvering mirrors. Copper amalgam has the quality of softening when worked, and of becoming hard on standing; consequently it has been used for filling teeth.

AM'ANA SOCIETY, a religious sect founded in Germany in 1714 by Eberhard Gruber. A body of members came to the United States, and after settling in New York in 1843 moved to Amana, Iowa, twelve years later. There are fewer than 2,000 persons in the community, but they own 26,000 acres of land, much of it well improved. They live in families, but the community as a whole engages in manufacture, agriculture and other industries. Meals are provided by several families in common.

AM'ARANTH, the name of certain plants whose flowers are composed of dry scales that retain their color for a long time and are often called *everlastings*. Prince's feather and coxcomb belong to this family and are common in gardens. The *globe amaranth* is used in some countries for decorating Roman Catholic churches in winter. The amaranth is a symbol of immortality.

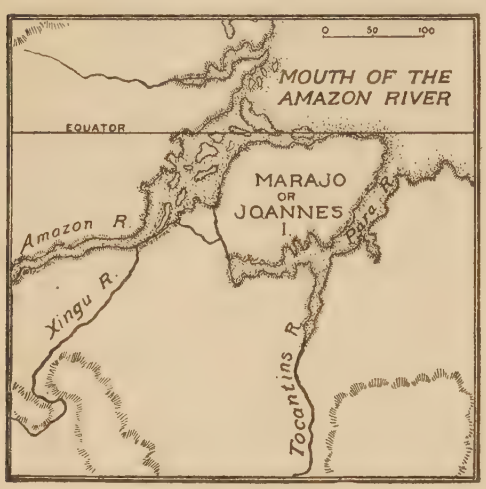
AMARILLO, *am a ril'o*, TEX., the county seat of Potter County, did not assume any importance until 1900, having been previously the headquarters of a few ranchmen. It is centrally located in the "Panhandle" of the state, 336 miles northwest of Fort Worth and 467 miles southeast of Denver. The transcontinental Santa Fe and Rock Island railroad systems serve the city, and it also has the Fort Worth & Denver City Railroad.

Amarillo is the commercial center for a vast cattle country, and is one of the greatest cattle-shipping cities. The surrounding country is also rapidly increasing its wheat-growing area. A new Federal building was completed in 1916 at a cost of about $200,000. There are four national banks and one state bank. The commission form of government was adopted in 1914. Population, 1910, 9,957; in 1917, 20,882 (Federal estimate).

AMARYLLIS, *am a ril' is*, **FAMILY**, an order of plants, generally bulbous, with a highly colored flower. They are natives of Europe and most of the warmer parts of the world. The order includes the snowdrop, the snowflake, the daffodil, the narcissus and the agave (American aloe). Many are highly prized in gardens and hot-houses, and are desirable cut flowers. The bulbs of some species are poisonous.

AMATI, *a mah'te*, a family of Cremona, Italy, who manufactured violins in the sixteenth and seventeenth centuries. Most of the violins made by them are of comparatively small size and flat model. Nicolo Amati was a tutor of Stradivarius.

AM'AZON, a river of South America, the largest in the world, formed by the confluence of a great number of streams which rise in the Andes in Peru. It is formed by the union of two main branches, the Marañon,



or Tunguragua, and the Ucayali, or Apurimac. The united Amazon, from the mouth of the Rio Negro to Tabatinga, is known as the Solimoens. It enters the Atlantic by a mouth 150 miles wide. From its junction with the Napo in Ecuador the Amazon flows due east; it is therefore almost wholly in the same latitude, which is not the case with any other large river. The total length of the river is between 3,300 and 4,000 miles. In its upper course navigation is interrupted by rapids, but from its mouth upward for a distance of about 3,000 miles, mostly in Brazil, there is no obstruction. It receives the waters of about 200 tributaries, 100 of which are navigable. Seventeen of these are from 1,000 to 2,300 miles in length, the largest being the Madeira. The Amazonian water system affords about 15,000 miles of river suitable for navigation.

The rapidity of the river is considerable, especially during the rainy season, from January to June, when it is subject to floods; but there is no great fall in its course. The tides reach up as far as 400 miles from its mouth. About the time of full moon a great tidal wave rushes into the mouth of the river with such force that it raises the water almost thirty feet. This singular phenomenon, known generally as the bore, is called *pororoca* by the natives. The river swarms with alligators, turtles and a great variety of fish. Steamers and other craft ply on the river, the chief center of trade being Para, at its mouth.

The Amazon was discovered by Yanez Pincon in 1500, but the stream was not navigated by any European till 1540, when Orellana descended it from the Andes to the mouth.

AMAZONS, according to ancient Greek tradition, the name of a community of women, who permitted no man to reside among them, fought under the conduct of a queen, and long constituted a formidable state. They were said to burn off the right breast, that it might not impede them in the use of the bow. Several nations of Amazons are mentioned, the most famous being those who dwelt in Pontus, who built Ephesus and other cities. They came into contact with

AMAZON, IN BERLIN

the Greeks three times: their queen, Hippolyta, was vanquished by Hercules; they attacked Attica in the time of Theseus, and they came to the assistance of Troy under their queen, Penthesilea, who was slain by Achilles.

AMBAS'SADOR, a minister of the highest rank, employed by one prince or state at the court of another. Ambassadors are *ordinary* when they reside permanently at a foreign court, or *extraordinary* when they are sent on a special occasion. When ambassadors extraordinary have full powers, as of concluding peace, making treaties, and the like, they are called *plenipotentiaries*. Until recently the United States sent no ambassadors to foreign countries, but were represented by *ministers-plenipotentiary*, ap-

pointed by the President with approval of the Senate. In 1896 the ministers to Germany, France, England and Italy were raised to the rank of ambassadors in recognition of similar action upon the part of those governments, and since that time other ambassadorships have been named, including the post at Japan. See DIPLOMACY; MINISTER.

AM'BER, a fossilized resin of pale yellowish or brown color. It is brittle and translucent and possessed of a resinous luster. It burns with a yellow flame, emitting a strong odor and considerable smoke, leaving an ash which is used as the basis of the finest black varnish. Electricity was first discovered in this substance, which becomes highly electric under friction. The Greek name for amber is *electron*, and from this the word *electricity* is derived. It is known that amber was once in liquid form, as the remains of insects are often found imbedded in specimens. These remains tell us that amber is a product of a former geological age, for all the insects preserved in it are of extinct species. Amber is found in the largest quantities on the Prussian coast of the Baltic Sea, where it is sometimes cast up by the waves, but it is generally dug from a deposit of carbonized wood, which is from forty to fifty feet below the surface. It is usually found in small pieces, but occasionally lumps weighing twelve or fifteen pounds are obtained. Amber is quite extensively used in the manufacture of mouthpieces for pipes and for cigar holders.

AMBERGRIS, *am'bur grees*, a substance derived from the intestines of the sperm whale and often found floating near the seashore. It is a yellowish or blackish white, fatty substance with a very agreeable odor, and is used in perfumes.

AMBROSE, *am'broze*, SAINT (about 340–397), one of the early Fathers of the Church, famed for his wisdom and gentleness. When elected bishop of Milan in 374 his modesty prevented him from accepting the place at once, though later in that position he earned the reverence of every one by his excellent character. He was the warm friend of Monica, the mother of Augustine, and the adviser of the latter. His works, which may be had in English translations, are still considered authoritative by the Church.

AMBROSIA, *am bro'zhah*, with nectar, the food and drink of the gods. The term ambrosia was sometimes used to mean both food and drink and was regarded as the main cause of the gods' eternal youth. They not only ate it and drank it, but bathed in it and anointed themselves with it. Sometimes as a punishment they were deprived of it for a time, and their power grew perceptibly less. If a mortal, on the other hand, was fed on ambrosia, he acquired the strength of a god and became immortal.

AM'BULANCE, a four- or two-wheeled wagon fitted up for the conveyance of injured persons. In the armies of the world the term is applied to movable field hospitals in connection with armies. Every principal city in America has its hospitals and police departments equipped with excellent ambulances in the charge of qualified surgeons. These vehicles, having the right of way over other vehicles, respond to accident calls sent by the police, and render most efficient first aid to the injured and then convey them to hospitals or homes. In war it has been specifically agreed that ambulances shall be immune from gunfire, but in the World War the Germans repeatedly fired upon allied ambulances.

AMEND'MENT, an alteration or change in a law, or a proposal to change a law or to change a resolution already under discussion in a public meeting. A general rule in parliamentary procedure is that an amendment to a bill or proposal may be amended, but that there can be no change in the amendment to the amendment. When an amendment is adopted it becomes a part of the original resolution, the latter being acted upon after all amendments are voted on.

When amendments are made in either house of Congress upon a bill which passed the other, the bill, as amended, must be sent back to the other house for concurrence. The Constitution of the United States contains a provision for its own amendment as follows:

> The Congress, whenever two-thirds of both houses shall deem it necessary, shall propose amendments to this constitution; or, on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this Constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; provided, that no amendment which

may be made prior to the year 1808 shall in any manner affect the first and fourth clauses in the ninth section of the first article; and that no state, without its consent, shall be deprived of its equal suffrage in the Senate.

For text of the Amendments to the United States Constitution, see Constitution of the United States.

AMERICA, the national hymn of the United States, beginning with the words, "My Country 'tis of Thee." The words were written by the Reverend Samuel Smith, and were first used in 1832 at a children's Fourth of July celebration in Boston. The tune was written by Henry Carey about 1742. The English anthem, "God Save the King," is set to this music. The words of the American hymn are as follows:

My country, 'tis of thee,
Sweet land of liberty,
Of thee I sing;
Land where my fathers died,
Land of the pilgrims' pride,
From every mountain side
Let freedom ring.

My native country, thee—
Land of the noble free—
Thy name I love;
I love thy rocks and rills,
Thy woods and templed hills,
My heart with rapture thrills
Like that above.

Let music swell the breeze,
And ring from all the trees
Sweet freedom's song;
Let mortal tongues awake;
Let all that breathe partake;
Let rocks their silence break—
The sound prolong.

Our fathers' God, to thee,
Author of liberty,
To thee we sing:
Long may our land be bright
With freedom's holy light;
Protect us by thy might,
Great God, our King.

AMERICA, or **THE NEW WORLD**, named from Americus Vespucius, who discovered a portion of the continent. The American continent consists of two grand divisions, North America and South America, with their adjacent islands. Each of these two divisions is also called a continent. The grand continent forms the barrier which divides the Atlantic and Pacific oceans for their entire length. The grand divisions are connected by the Isthmus of Panama, which at its narrowest point is only twenty-eight miles in width. Through this isthmus the Panama Canal was cut. In the northwest, the continent approaches within about fifty miles of Asia, from which it is separated by Bering Strait. For a detailed description of the grand divisions, see NORTH AMERICA; SOUTH AMERICA; CENTRAL AMERICA.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, THE, one of the most noted scientific societies in the United States. It was organized as the Association of American Geologists and Naturalists, but in 1847 the present name was adopted. The purpose of the organization is to encourage and promote scientific work and research and to gain an extended influence for all scientific movements. The society is divided into nine sections: mathematics and astronomy, physics, chemistry, mechanical science and engineering, geology and geography, zoology, botany, anthropology, economic science and statistics. Among its members, which number about 3,500, are found the most prominent leaders of American science, as well as many educators and other noted men who are in sympathy with the work. The association holds yearly meetings, which last one week. During this time its various sections meet separately. An annual volume of proceedings is published, and this constitutes one of the most valuable contributions to scientific literature.

AMERICAN BEAUTY, an elegant cultivated rose which was first grown in hothouses of the United States. The large, showy flowers, with velvety petals of a deep, rich red, grow quite tall on stiff, thick, woody stems. Owing to their fragrance and beauty the flowers are popular and usually expensive, especially at the Christmas season, when they may sell for $12 to $24 per dozen.

AMERICAN FEDERATION OF LABOR. See LABOR UNIONS.

AMERICAN GOLDFINCH, YELLOW-BIRD, or THISTLE-BIRD, often incorrectly called the wild canary. The male is a bright yellow with black cap, wings and tail, and the female a yellowish brown. In spring these birds may be seen in small flocks feeding on thistle seeds or hemp seeds. They rarely light upon the ground except when drinking. The name yellowbird is also given to the little American yellow warbler. See NEST, *color plate*, Fig. 3.

AMERICAN INDIANS. See INDIANS, AMERICAN.

AMERICANISMS, a term applied to certain words and idioms of the English language peculiar to the United States. They may be words that have originated in America; words that are used in America while they have become obsolete in Great Britain, or words that are used in America in a different sense from that understood in Great Britain. Many Americanisms have come into reputable use, but others are merely local and may be regarded as provincialisms. Following are a few of the more common Americanisms:

Around or round, about or near. To hang around is to loiter about a place.

Backwoods, the partially cleared forest regions in the western states.

Baggage, luggage.

Blizzard, a fierce storm of snow or sleet.

Bogus, false, counterfeit.

Boss, an employer or superintendent of laborers, a leader.

Bronco, a native or Mexican horse of small size.

Bug, a coleopterous insect, that is, a beetle.

Buggy, a four-wheeled vehicle.

Bulldoze, to intimidate.

Bureau, a chest of drawers, surmounted by a mirror; called in England, a dressing-table.

Calculate, to suppose, to believe, to think.

Canebrake, a thicket of canes.

Canyon, a deep gorge between high, steep banks worn by water courses.

Caucus, a meeting of the leading politicians of a party to lay the plans for an approaching election or to decide upon any course of action.

Chunk, a short, thick piece of wood or any other material.

Clever, good-natured, obliging.

Cowboy, a cattle herder or drover on the western plains.

Cowhide, a whip made of twisted strips of rawhide.

Creek, a small river or brook; not, as in England, a small arm of the sea.

Creole, a person of French or Spanish descent who is a native of Louisiana or one of the adjoining gulf states.

Cunning, small and pretty.

Dead-heads, people who have free admission to entertainments, or who have the use of public conveyances, or the like, free of charge.

Depot, a railway station.

Down east, in or into the New England states; down-easter is a New Englander.

Drummer, a commercial traveler.

Dry goods, a general term for such articles as are sold by linen-drapers, haberdashers and hosiers.

Dude, a dandy, one who dresses in the extreme of fashion.

Fall, autumn.

Fix, to put in order, to prepare, to adjust.

Gerrymander, to arrange political divisions so that in an election one party may obtain an advantage over its opponent, even though the latter may possess a majority of votes in the state; from the deviser of such a scheme, Elbridge Gerry, governor of Massachusetts.

Given name, a Christian name.

Grit, courage, spirit, mettle.

Guess, to believe, to suppose, to think, to fancy.

Gulch, a deep, abrupt ravine, caused by the action of water.

Help, a servant.

Highfalutin, inflated speech, bombast.

Hoe-cake, a cake of Indian meal baked on a hoe or before the fire.

Hustle, to hurry.

Jew, to haggle, or to "beat down" in price.

Johnny-cake, a cake made of Indian corn meal; the term is also applied to a New Englander.

Lasso, to catch horses or cattle by means of a rope or thong of leather with a running noose.

Likely, promising.

Loafer, a lounger, a vagabond.

Lobby, to solicit members of a legislative body for the purpose of influencing their votes.

Log-rolling, a system of political coöperation or scheming.

Lot, a piece or division of land, an allotment.

Lumber, timber sawed for use; as beams, joists, planks.

Lynch law, an irregular species of justice executed by the populace or a mob, without legal authority or trial.

Moccasin, a shoe of soft leather, originally worn by the American indians.

Muss, a state of confusion.

Notions, a term applied to every variety of small wares.

Ore-horse; a one-horse thing is a thing of little value or importance.

Pickaninny, a negro child.

Planks, in a political sense, are the several principles which appertain to a party; platform is the collection of such principles.

Rile, to irritate, to drive into a passion.

Rooster, the common domestic cock.

Saloon, a tap-room.

Scalawag, a scamp, a scrapegrace.

Shanty, a temporary hut.

Sick, ill.

Skedaddle, to run away; a word introduced during the Civil War.

Smart, often used in the South in the sense of considerable.

Span, of horses, two horses as nearly as possible alike, harnessed side by side.

Spread-eagle style, a compound of exaggeration, bombast, mixed metaphor, etc.

Spry, active.

Succotash, an Indian dish made of maize and beans boiled together.

Tenderfoot, a newcomer; used especially in the West.

Truck, the small produce of gardens.
Trust, an organization for the control of several corporations.
Ugly, ill-tempered, vicious.
Wilt, to fade, to decay, to droop, to wither.

AMERICAN LEGION, organized at Saint Louis, Mo., in May, 1919, and incorporated in the same year by act of Congress, is a patriotic organization of soldiers and sailors who were in the service of the United States in the World War. Its object is to uphold and defend the Constitution of the United States; to maintain the dignity of law against lawlessness; to foster pure Americanism; to combat autocracy, whether of the masses or of special classes; to promote peace; to safeguard justice; to sanctify the comradeship of the war by mutual helpfulness. The organization is non-political.

AMERICAN LITERATURE. See LITERATURE.

AMERICAN PARTY. See KNOW-NOTHINGS.

AMERICAN UNIVERSITY, a coeducational institution maintained at Washington, D. C., by the Methodist Episcopal Church. In 1891 a charter for the university was granted by the District of Columbia, but the school was not formally opened until 1914. The university buildings are situated on a campus of ninety-two acres, which has a pleasant outlook over the city and surrounding country. Fellowships for graduate work, lectureships and the publication of theses and lectures are included in the activities of the institution, which reported a student enrollment of forty-one in 1917.

AMERICUS, GA., the county seat of Sumter County, is seventy-one miles southwest of Macon, on the Seaboard Air Line and the Central of Georgia railroads. The town was settled in 1832 and incorporated in 1855. Cotton and sugar cane are the principal products of the vicinity, and the industries are principally connected with these. There is also a flourishing lumber trade. A Federal building was erected in 1912, costing $80,000. The city is the seat of the Third Agricultural District College. There is a Carnegie library and a large private hospital owned and operated by women. The city has sixty-one miles of streets, and a motor fire department. Population, 1910, 8,063; in 1917, 8,345 (Federal estimate).

AMERICUS VESPUCIUS, *ves pu'she us*, (1451–1512), a maritime discoverer, after whom America was named. He was born at Florence, Italy. In 1499, in the employ of Spain, he coasted along the continent of America for several hundred leagues; and again in 1503, under Portuguese auspices, he explored South America from Cape Saint Roque to Cape Frio. From 1505 to his death he was pilot-major of Spain, and did much to further exploration and discovery. His name was first suggested by a map-maker, as a fit name for the New World (meaning Brazil). It was later applied to South America and finally extended to both continents. Vespucius was a friend of Columbus.

VESPUCIUS

AMHERST, NOVA SCOTIA, the county-town of Cumberland county, on the Bay of Fundy and on the Intercolonial Railway between Halifax and St. John. Industrially Amherst is of great importance; the neighborhood supplies coal, lumber and agricultural produce, and the town manufactures railroad cars, woolen goods, pianos, boots, and shoes and malleable iron. Population, 1916, 8,973.

AMHERST COLLEGE, a college located at Amherst, Mass. It was established by an association of Congregational and Presbyterian ministers in 1815, and was the outgrowth of Amherst Academy. Six years later it was opened as a college, and now ranks as one of the foremost colleges of New England. It is known especially for its adherence to classical and general culture, and for never attempting to do university work. The faculty numbers about fifty, and its average enrollment is over 500. The library has over 115,000 volumes.

The town of Amherst is located in a picturesque region in Hampshire County, sixteen miles north of Springfield. It is also the seat of Massachusetts Agricultural College. Population, 1913, 5,308.

AMETHYST, *am'e thist*, a purple variety of quartz, which usually occurs in crystals, forming very beautiful specimens. The coloring is supposed to be due to manganese.

Amethyst is found in Siberia, India, Ceylon and numerous other places. In the United States it occurs in largest quantities around Thunder Bay on Lake Superior. The oriental amethyst is a beautiful and costly gem, and is a variety of corundum. The Greeks believed amethyst to be a protection against the effects of intoxicating liquors and hence gave it its name, which means *without wine*. Among them it is worn by those who were addicted to drunkenness. It is needless to say that it has never been known to effect a cure.

AMIENS, *ah' myaN'*, FRANCE, in 1914 a beautiful and prosperous city; in 1918 a place of ruin and desolation. This "Queen City of the Somme," situated eighty-one miles north of Paris, on the banks of the River Somme, had a population of about 120,000 at the beginning of the World War. It was the capital of the department of Somme, and was a notable educational and manufacturing center. Early in the war it was captured by the Germans, but when the Battle of the Marne (1914) forced their retreat they evacuated it.

AMMON AND MUT

As the war progressed Amiens became an important base for the British army in France, and a center of railway communication between Paris and the English Channel. During the great German drive of the spring of 1918 possession of the city was hotly contested. Between April 1 and May 1, 5,800 large caliber shells and 680 aerial bombs fell on the place, and incredible damage was done to its fine buildings and homes. In May, 1918, fewer than 1,000 civilians were left in the stricken city, which still barred the way of the invaders to the Channel ports, but after the allied victories of July and August the task of rebuilding the city was vigorously begun. Amiens Cathedral, one of the finest examples of Gothic architecture in Europe, was not damaged beyond repair by German shells.

AM'MON, an ancient Egyptian deity, identified by the Greeks and Romans with Jupiter, and represented as a human being with a ram's head, or simply with the horns of a ram. There was a celebrated temple of Ammon in the Oasis of Siwah in the Libyan desert. The goddess Mut was Ammon's wife.

AMMO'NIA, an alkaline substance, which differs from the other alkalies by being gaseous, and is hence sometimes called the *volatile alkali*. It is a colorless, pungent gas, composed of nitrogen and hydrogen. It was first procured in that state by Priestley, who termed it *alkaline air*. He obtained it from sal-ammoniac by the action of lime, and it is still generally prepared by that method. It is used for many purposes, both in medicine and chemistry, sometimes in the gaseous state, but generally in solution in water, under the names of *liquid ammonia, aqueous ammonia* or *spirits of hartshorn*.

Ammonia may be procured naturally from decaying animal substances; artifically it is chiefly obtained from the distillation of coal and of refuse animal substances, such as bones, clippings and shavings of horn, hoof, etc. It may also be obtained from vegetable matter when nitrogen is one of its elements. Sal-ammoniac is the chloride of ammonium.

AM'MONITE, a fossil animal allied to the nautilus, having a many-chambered shell like a curved ram's horn. In some forms it is found in immense numbers and of great size.

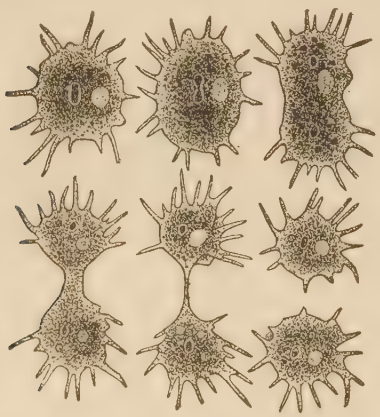
AMMONITES

AMMO'NIUM, the name given to the supposed base of ammonia, similar to a metal, as potassium. It has not been separated as such, but it is believed to exist in an amalgam with mercury.

AMMUNITION, *am mu nish'un*, the ball, powder and primer necessary to the firing of guns of all sizes. The various kinds of ammunition, such as bullet, cartridge, gunpowder, explosives, shrapnel and shell, are described in these volumes.

AM'NESTY, a term used in describing the action of a government in pardoning those who have conspired against it, or otherwise violated its laws. During the Civil War President Lincoln issued a proclamation of amnesty, in which full pardon was offered to those secessionists who would swear allegiance to the United States government. A general amnesty was proclaimed after the war by President Johnson. As generally understood, *amnesty* refers to the forgiveness of large numbers collectively, while *pardon* refers to the forgiveness of an individual.

AMOEBA, *a me'bah*, the typical example of one-celled animals. The amoeba is found in stagnant water, where it clings to weeds, dead leaves and other objects under the surface. It cannot be seen with the naked eye, as it rarely becomes more than $^1/_{100}$ of an inch in diameter. It appears like a shapeless blob of jelly, and is in reality a cell of protoplasm (see PROTOPLASM). The central part of the amoeba is semi-transparent and resembles ground glass in appearance. Around the outer edge is a border of perfectly transparent and colorless substance. Within the granular part may be seen a small brown mass which is a little darker than the



AMOEBA
Showing six stages in the process of reproduction.

rest and is called the *nucleus*. Another little structure in the granular part is a clear, rounded space which disappears periodically with a sudden contraction and then slowly reappears.

Under the microscope the amoeba is seen to change its form frequently by sending out little finger-like processes called *pseudopodia*. This process starts as a little pimple-like elevation which grows in size as the body flows toward it. Of course the volume of the amoeba is not changed, and whatever is protruded from one part of the body must be withdrawn from another. Whenever one of these pseudopodia comes in contact with anything digestible, the amoeba flows around it and is capable of digesting the food as though a special stomach had been improvised. When the process of digestion is over, the waste matter is pushed through the side opposite to that on which it entered.

Amoebas are reproduced by the simple process of division; a line forms through the nucleus and through the protoplasm, a single amoeba becoming two.

A'MOS, one of the minor Hebrew prophets and supposed author of the book which bears his name. He was a herdsman and prophesied, it is supposed, about 760 B. C. His prophecies were directed against the idolatrous nations around him and against the Jews themselves for their idolatry. His writings, which are marvels of clearness and of vigor, were edited at a period long after his death.

AMOY', CHINA, a seaport town situated nearly opposite the center of the island of Formosa, on the south end of the island of Amoy. It is at the mouth of two united rivers, and its harbor is one of the best on the Pacific. The imports are cotton, opium, metals, clocks, indigo and grain, and the exports are tea, camphor, sugar, earthenware and paper. The town was captured by the British in 1841, and by the Treaty of Nanking in 1842 this port was opened to their trade. Population, 1911, 114,000.

AMPERE, *ahN pare'*, ANDRÉ MARIE (1775–1836), a French scientist and mathematician, famed especially for his discoveries in electricity. He was born at Lyons. In 1801 he became professor of physics in the central school of the department of Ain at Bourg. Later he went to Paris, where he acquired a wide reputation as a teacher in the polytechnic school. In 1824 he was appointed professor of experimental physics in the College de France. Ampere originated the theory that magnetism and electricity are identical, and the *ampere*, an electrical unit, is named for him. See ELECTRICITY.

AMPHIBIANS, *am fib'e anz*, a class of vertebrate animals which in their early life

breathe by gills and afterward partly or entirely by lungs. They are called amphibians because of their ability to live either on land or in water; the name is from a Greek word meaning *having a double life.* In some species the gills are retained through life, although lungs also are developed. There are two main divisions of this class—the tailless, represented by frogs and toads, and the tailed, such as newts and salamanders.

Related Articles. Consult the following titles for additional information:

Blindworm	Newt
Frog	Toad

AMPHICTYONIC, *am fik te on'ik,* **COUNCIL**, in ancient Greece, a confederation of the twelve northern tribes, for worship and for the protection of sacred lands and treasures. It also discussed questions of international law and matters affecting the political union of the tribes. Meetings were held twice a year, alternately at Delphi and Thermopylae. The tribes sent two deputies each, who quelled the public dissensions and the quarrels of individual cities by force or persuasion, and punished civil and criminal offenses, particularly transgressions of the law of nations and violations of the temple of Delphi.

AMPHION, *am fi'on,* in Greek mythology the son of Jupiter and Antiope, and the husband of Niobe. He was instructed in music by Mercury or, according to others, by Apollo, and his skill was so wonderful that when he was set to build the walls of Thebes, he simply played on his lyre, and the stones moved and arranged themselves in their proper positions.

AMPHITHEATER, *am fe the'a tur,* an ancient Roman edifice of elliptical or circular form, used for gladiatorial combats and other sports. It consisted of a roofless, central area, the arena, which was encompassed with rows of seats, rising higher as they receded from the center. On these the people used to sit to view the combats. The first amphitheater of wood in Rome was erected in 46 B. C. by Caesar, and in 30 B. C., under Augustus, the first amphitheater partly of stone was built. The example of the Romans was followed by all the large cities throughout the Empire. The Colosseum, or Flavian Amphitheater, at Rome, is the largest of all the ancient amphitheaters, being capable of seating from 50,000 to 80,000 persons (see COLOSSEUM). That at Verona is one of the best examples remaining. It is 502 feet by 401, and 98 feet high.

AMPUTA'TION, in surgery, the operation by which a limb or other member is separated from the body. Amputations have been practiced from very early times, but in the larger operations death was formerly almost sure to follow from bleeding or from blood-poisoning. It was not until late in the seventeenth century that surgeons learned how to stop bleeding, and much later before they could keep out infection (see SURGERY). In the amputation of a limb the flesh is cut in a slanting direction to the bone so as to leave one or more flaps of flesh. The blood vessels are tied up, the bone sawed off, and the flaps brought smoothly over the stump and stitched down. During the World War remarkable advance was made in surgical practice, and great success was achieved in the re-education of those who had suffered the loss of a limb.

AMRITSAR, *um rit'sahr,* or **AMRITSIR**, INDIA, a flourishing commercial town of Hindustan, capital of a district of the same name in the Punjab, the principal place of the religious worship of the Sikhs. It receives its name from the sacred pond constructed by Ram Das, the apostle of the Sikhs in which the Sikhs and other Hindus immerse themselves that they may be purified from all sin. It has considerable manufactures of shawls and silks and exhibits the richest products of India. Population in 1911, 152,756. See PUNJAB.

AM'STERDAM, NETHERLANDS, one of the chief commercial cities of Europe, and the largest in Holland. It is also famous as a center of art and learning, and was the home of Rembrandt, the painter. On account of the lowness of the site of the city, the greater part of it is built on piles. It is divided by numerous canals into about ninety islands, which are connected by nearly 300 bridges. The harbor, formed by the Y, an arm of the Zuyder Zee, lies along the whole of the north side of the city and is surrounded by various docks and basins. The trade is facilitated by the great ship canal, fifteen miles long and twenty-two to twenty-six feet deep, which was completed in 1876 and connects the Y directly with the North Sea. Another canal, the North Holland Canal, forty-six miles long and twenty feet deep, connects Amsterdam with the Helder.

Among the principal buildings in Amsterdam are the palace or town hall, the new *Stadthuis,* the Bourse, the *Rijks Museum* and the New Church, founded in 1408. The city is also well supplied with hospitals and charitable and educational institutions. The chief manufactures are tobacco, glass, soap, jewelry, linen, silk and machinery. One of the chief industries is diamond-cutting, for which the city is especially famous. Amsterdam ranks much higher as a trading town than as a manufacturing town. During the seventeenth and eighteenth centuries it was one of the wealthiest and most flourishing cities in the world. Its forced alliance with France ruined its trade, but since 1813 its commerce has revived, and in normal years the annual tonnage entering and clearing the port is between 3,000,000 and 4,000,000. The city is well fortified. Population, 1909, 566,131; in 1914, 609,084.

AMSTERDAM, N. Y., founded in 1778 and called Veedersburg until 1804, is thirty-four miles west of Albany, on the New York Barge Canal and on the New York Central and the West Shore railroads. There is also interurban service. The city has a Carnegie Library and two hospitals. The manufactures of the city amount to half a million dollars every week; more pearl buttons are made here, it is claimed, than in any other town in the world. It is also a notable carpet-manufacturing city. Among other products are gloves and knit goods. Population, 1910, 31,267; in 1916, 38,043 (Federal estimate).

AMU, *ah moo′,* or **AMU-DARYA,** *ah moo dahr′ya,* (ancient Oxus), a large river of central Asia that rises in the Pamir between Bokhara and India, flowing northwesterly into the Sea of Aral. Its length is about 1,600 miles, 800 of which are navigable for light boats. In its course the Amu receives a number of tributaries and in historic times has frequently changed its course. As late as the early part of the sixteenth century it flowed into the Caspian Sea. This river is of importance because it is the source of water for the irrigation of the surrounding country.

AM′ULET, an object worn by the superstitious to protect the owner from sickness and misfortune. Metal objects of every conceivable shape—ears, teeth and tongues of animals, plants, sacred relics and jewels are typical examples of such charms. In the Orient, where the practice of wearing amulets originated, the custom is still common, and it is not wholly unknown in Europe and America.

AMUNDSEN, *ah′mun sen,* ROALD (1872–), a Norwegian explorer whose crowning achievement was the discovery of the South Pole. He was born at Borje, Norway, and educated for the navy. As first mate of the *Belgica* he engaged in Antarctic explorations in 1897–1899, but his first really notable work was done in connection with his search for the north magnetic pole (1903–1905). He proved that the pole is not stationary, and recorded observations of inestimable value. In 1905 his ship, the Gjoa, sailed through the long-sought Northwest Passage, thus rounding out nearly four centuries of endeavor.

ROALD AMUNDSEN

Amundsen began his epoch-making voyage to the South Pole in 1910. In Nansen's ship, the *Fram,* he reached the southern continent in January, 1911, and on the great ice cap established headquarters. In October of that year he and four companions began an overland journey with dogs and sledges, and after weeks of perilous traveling they reached the Pole on December 16. Their small tent, with the Norwegian flag floating above it, was found later by the ill-fated Scott party (see SCOTT, ROBERT FALCON). Amundsen has lectured in many different countries, and has published the story of his discovery in a book entitled (English edition) *The South Pole.*

AMUR, or **AMOOR,** *ah moor′* a river of Eastern Asia, formed by the union of the Shilka and Argun rivers. It flows first in an easterly direction and then southeast along the northern boundary of Manchuria. At the eastern boundary of Manchuria it flows northward until it empties into the strait, opposite the island of Saghalien, which opens into the sea of Okhotsk. The Amur is about 2,680 miles long. For the most part it is open for navigation and is valuable for commerce. In 1916 a new port

called Nicolaievsk was opened at the mouth of the Amur, to relieve freight congestion at Vladivostok.

ANABAP'TISTS, a name given to a Christian sect because, as they objected to infant baptism, they baptized all those who joined them. In 1520 Switzerland became a center for Anabaptists, from which they spread to the Netherlands and Westphalia. In 1534 the town of Münster in Westphalia was their center of action. Bockhold became leader, assuming the name of John of Leyden, king of the New Jerusalem, and the city was the scene of much cruelty and fanaticism. After 1535 the Anabaptists are not heard of as a distinct sect, but modern Baptists agree with them in rejecting infant baptism.

ANACON'DA, the popular name of two of the largest species of the serpent tribe. The Ceylonese species is said to reach thirty-three feet in length; the other, a native of tropical America, the largest of the serpents, attains the length of forty feet. The name is often applied to any large snake that crushes its prey. See Boa; Python.

HEAD OF THE ANACONDA

ANACON'DA, Mont., the county seat of Deer Lodge County, twenty-seven miles northwest of Butte, on the Northern Pacific, the Great Northern, the Chicago, Milwaukee & Saint Paul and other railroads. The copper smelting works in the city are among the largest in the world; one smelter employs 4,500 men. There are also railroad shops, foundries, machine-shops and brick yards. Deposits of graphite and sapphires are found in the vicinity. The city has public parks, two opera houses and the Hearst Free Library. The place was settled in 1883 when the reduction works were established, and has developed with the copper industry. Population in 1910, 10,134; in 1917, 10,631 (Federal estimate).

ANACREON, *an ak're on*, (561–476 B. C.), a Greek lyric poet, a native of Teos, in Ionia. Only a few fragments of his works have come down to us; the collection of odes that usually passes under the name of Anacreon is mostly the production of a later time.

ANAEMIA, *a nee'me ah*, a diseased condition in which the blood becomes very much weakened. The more severe form of the disease, called primary or pernicious anaemia, is usually fatal. Its cause is not known. It is accompanied by a decrease in the number of the red blood corpuscles. Secondary anaemia, which is an accompaniment of many diseases, may be cured by nourishing food, fresh air and medicines that tend to strengthen the blood. Anaemic persons often become so through overwork or disregard of hygienic laws.

AN'AGRAM, a word, phrase or sentence formed by transposing the letters of another word, phrase or sentence so as to make an entirely different meaning. Thus, the letters in the name *Florence Nightingale* make "Flit on, cheering angel." The force of an anagram depends on its containing exactly the same letters as the original word or phrase and on its having some connection, eulogistic or humorous, with the original name or thought. In former times the making of anagrams was a very popular pastime and many men of great ability did not find it beneath them to use their ingenuity to this end, but at present the device has gone out of fashion except in the puzzle columns of magazines.

ANALYSIS, *an al'i sis*, the separation of anything into its elements. The word is derived from a Greek word meaning to *break up into parts*. It is used in connection with philosophy, chemistry and grammar.

In Philosophy. In philosophy analysis is the mode of resolving a compound idea into its simple parts, in order to consider them more distinctly and arrive at a more precise knowledge of the whole. It is opposed to *synthesis*, by which we combine and class our perceptions and contrive expressions for our thought so as to represent their several divisions, classes and relations.

In Chemistry. In chemistry analysis is the process of taking apart a compound substance for the purpose of determining either (*a*) what elements it contains (*qualitative analysis*), or (*b*) how much of each element is present (*quantitative analysis*). Thus by the first process we learn that water is a compound of hydrogen and oxygen, and by the second that it consists of one part of hydrogen by weight to eight parts of oxygen.

In Grammar. To analyze a sentence is to break it up into its various parts, pointing out its subject, predicate, object, modifying

phrases, etc. Model sentences and their complete analyses are given in all texts on grammar. Consult in these volumes the article LANGUAGE AND GRAMMAR.

ANAM'. See ANNAM.

ANANI'AS, the name of three biblical characters: 1. A disciple at Jerusalem who, with his wife Sapphira, kept back a part of the price of land they had sold, and told the disciples they were giving all. They were both struck dead for the crime (*Acts* V, 1–10). At the present time any habitual liar is called an Ananias. 2. A high priest at Jerusalem (*Acts* XXIII, 2). 3. A disciple at Damascus (*Acts* X, 10–17).

ANARCHISTS, *an'ahr kists*, a revolutionary sect or party, setting forth, as the social ideal, the extreme form of individual freedom. Anarchists hold that all government is injurious and immoral, and that the destruction of every social form now existing must be the first step to the creation of a new and just society. The anarchists first assumed independent importance about 1872, when they separated from the Social Democrats. Their principal journals have been *La Revolte* (Paris), the *Freiheit* (New York), *Liberty* (Boston) and the *Anarchist* (London). The anarchists in America have accomplished little, though President McKinley was assassinated by an anarchist. Anarchism gained its surest foothold in Russia, under the despotism of the czars.

ANAT'OMY, the science which treats of the structure of animals and plants, is divided into numerous branches. *Animal* anatomy treats of the structure of animals; *vegetable* or *plant* anatomy, of the structure of plants; while *human* anatomy pertains to the structure of the human system. *Comparative* anatomy relates to the study of animals with a view to comparing their structure with that of the human body or with that of animals of different orders.

Previous to the Christian era, little was known of the structure of the human system. Most peoples held the body sacred after death and dissection was not allowed. The earliest dissection was among the Greeks, about 450 B. C. At this time Hippocrates and his school obtained some knowledge of the skeleton and the larger internal organs. Dissection was first practiced in public in Alexandria, where considerable advance was made in the knowledge of human anatomy, but prejudice against the practice was so strong that it was given up and nothing further was achieved for several hundred years. In the thirteenth and fourteenth centuries the value of dissection for those studying medicine became evident, and the rulers of leading European nations ordered a certain number of dissections in the medical schools each year. From this the practice became general in all universities having medical schools attached to them.

At the present time the science of anatomy has reached a high degree of perfection in all the medical colleges of America and Europe, and each of the branches of human anatomy has been itself divided into numerous subdivisions; so that physicians who wish to become specialists, after obtaining a general knowledge of the human system, confine their investigations to one branch, such as histology, or to the eye or the brain and nerves. Anatomy is closely related to surgery, since the successful surgeon must be acquainted with the position and structure of every organ in the body.

The reader will find a wide range of topics relating to anatomy in these volumes. The brain, muscles, nerves, skeleton and numerous kindred subjects are treated in alphabetical order under their appropriate headings.

AN'CESTOR WORSHIP, a type of religion in which veneration for one's ancestors assumes the form of actual worship. It has prevailed among savage tribes and among peoples of a high degree of civilization, such as the Egyptians and Chinese. In China today many homes have small wooden tablets revered as the dwelling places of ancestral spirits, and before which incense is daily burned. In Egypt veneration for the dead led to a marvelous development of the art of embalming, and was responsible, too, for such masterpieces of architecture as the Pyramids, which were the tombs of the kings.

ANCHOR, *an'kor*, an instrument of iron or other heavy material used to prevent a ship from drifting. The invention of so necessary an instrument is to be referred, as may be supposed, to the remotest antiquity. The most ancient anchors consisted merely of large stones, baskets full of stones, sacks filled with sand or logs of wood loaded with lead. The ordinary modern anchor has two spade-like points or *flukes* at the end of a shank, to which the anchor chain is fastened. A crossbar is usually added, so arranged that a horizontal pull on the chain will drive one of the flukes into the ocean bottom. To loosen the anchor, a vertical pull is necessary.

Patent anchors have two flukes, pointing in the same direction and loosely bolted to the shank, so that they will turn and both take hold of the earth at once.

ANCHOVY, *an ko'vi*, a small fish of the herring family. The common anchovy, esteemed for its rich and peculiar flavor, is not larger than the middle finger. It is caught in vast numbers in the Mediterranean

ANCHOVY

and frequently on the coast of France, Holland and the south of England. A similar species is found on both the Atlantic and Pacific coasts of America. Anchovies are marketed in salted form, and are extensively used in the preparation of sauces.

ANCIENT MARINER, RIME OF THE, a poem by Samuel T. Coleridge, first published in 1798 in a volume entitled *Lyrical Ballads*. This volume was the joint work of Wordsworth and Coleridge, and its appearance marked the beginning of the Romantic Period of English poetry. *The Ancient Mariner* is not only a masterpiece of the Romantic Period, but it is one of the world's masterpieces. It is supposed to be the story of a mariner who has returned from a long voyage, and it recounts in matchless verse the tortures he suffered because he killed the sacred albatross. Throughout the poem there is weirdly suggested the supernatural, and the poet's skill in the use of rhyme, meter and phraseology to obtain this effect is unsurpassed in English poetry. If there is a moral lesson in the poem it is found in these lines:

> He prayeth best, who loveth best
> All things both great and small;
> For the dear God who loveth us,
> He made and loveth all.

ANCIENT ORDER OF UNITED WORKMEN, a fraternal benevolent organization founded at Meadsville, Pa., in 1868. It is governed by a "supreme lodge" which has control over the "grand" or "state" lodges, which in turn govern the subordinate lodges. It pays a benefit of $2,000 to families of deceased members. The order has forty grand lodges, over 4,500 sub-lodges and about 400,000 members. It has disbursed since its organization over $250,000,000 in benefits.

ANDAMANS, *an'da mańz*, a chain of islands on the east side of the Bay of Bengal, 680 miles south of the mouth of the Ganges. The surface is densely covered with forests which yield valuable timber, and the soil is very fertile. The inhabitants are small, generally much less than five feet, well formed and active, skillful archers and canoeists and excellent swimmers and divers. These islands have been used since 1858 as a penal settlement by the Indian government, the settlement being at Port Blair, on South Andaman. Population in 1911, 26,500.

ANDERSEN, *ahn'-dur s'n*, HANS CHRISTIAN (1805–1875), a Danish novelist, poet and writer of fairy tales which delight children in all lands, was born at Odense. He was put to work early, but managed in his leisure moments to pick up the beginnings of an education.

HANS CHRISTIAN ANDERSEN

In 1819 he went to Copenhagen, determined to make his fortune as a dramatist, and although he wrote nothing of note his abilities brought him friends, who procured him free entrance into a government school at Slagelse. From this school he was transferred to the university, and while there he published a volume of poems which attracted some notice.

Having received a royal grant to enable him to travel, in 1833 Andersen visited Italy, his impressions of which he published in *The Improvvisatore*. The scene of his following novel, *O. T.*, was laid in Denmark, and in *Only a Fiddler* he described his own early struggles. In 1835 appeared the first volume of *Fairy Tales*, for which he is most famous. Among his other works are the *Picture-book without Pictures; A Poet's Bazaar; The Two Baronesses*, written in English, of which he had gained command during a trip in England; an autobiography, *My Life's Romance*, and *In Sweden*. Andersen's genius was fully recognized before his death, and high honors were shown him in his old age. While no one has ever been able to look at things more completely from a child's point of view, or so to delight children, Andersen did not like children, nor was he attractive to them, a most remarkable fact in his life.

ANDERSON, IND., settled in 1822 and named for an Indian chief, is the county seat of Marion County, and is thirty-six miles northeast of Indianapolis. The Pennsylvania and the Big Four railroads enter the city, and it is the center of an extensive interurban service. White River flows through the town. It has many manufacturing interests, due to a hydraulic canal which furnishes power. Here the famous Remy magneto is made, and there is a great factory of the American Steel and Wire Company. The city has a new Y. M. C. A. building which cost $250,000, and fine manual training high school. There is a Carnegie Library. Population, 1910, 22,476; in 1917, 24,230 (Federal estimate).

ANDERSON, MARIE ANTOINETTE (1859–), commonly known as Mary Anderson, an American actress, born in Sacramento, Cal. She studied for the stage under Charlotte Cushman, and on her first appearance as Juliet, in 1875, scored a distinct success. In this rôle and in that of Rosalind in *As You Like It,* Meg Merrilies in *Guy Mannering* and Perdita in *A Winter's Tale,* she retained her popularity until her withdrawal from the stage in 1889. In the following year she married Antonio Navarro de Viana. Her home is in New York City.

ANDERSON, ROBERT (1805–1871), an American soldier, commander of Fort Sumter when it was attacked in April, 1861. He was born in Kentucky, and served in the Black Hawk, Florida and Mexican wars. As major of artillery he was in charge of Forts Moultrie and Sumter when the Civil War threatened, and moved all his forces into the latter when South Carolina seceded. His defense of the fort was brave, but unsuccessful. Anderson was brevetted major-general at the close of the war. See FORT SUMTER.

ANDERSON, S. C., the county seat of Anderson County, known locally as *The Electric City,* was founded in 1827, and is thirty-two miles southwest of Greenville. The Southern and the Charleston & West Carolina railroads serve the city, and there is an electric line, built in 1913. The public service utilities are privately owned. There are nine cotton mills in the city, also manufactories of spring beds and flour. Here are located Anderson Female College, a business College, a Carnegie Library and two hospitals. The population, more than three-fifths white, was 9,654 in 1910, and 12,687 (Federal estimate) in 1917.

ANDERSONVILLE, GA., a village in Sumter County, sixty-two miles south of Macon, of historic importance because it was the site of the most noted Confederate prison during the Civil War. In 1863 the Confederate government enclosed about twenty-two acres of ground near the village, with a stockade fifteen feet high. The following June this was increased to twenty-seven acres, but a portion of this was useless because of the establishment of a dead line. Within this enclosure at times as many as 33,000 Union prisoners were confined. They had no shelter and their surroundings were extremely unhealthful. When Sherman's army marched through Georgia the Confederates were obliged to abandon Andersonville, and the prisoners were removed to Milan, Ga., and then to Florence, S. C., where conditions were much improved. The large number of deaths due to the bad conditions in Andersonville prison was investigated by a special military court, and the prison superintendent, a Swiss named Henry Wirz, was convicted of murder and hanged. Part of the evidence for his conviction was furnished by a Confederate medical commission.

ANDES, *an'deez,* (Spanish, *Cordillera de los Andes,* or *Cordilleras*), a range of mountains stretching along the whole of the west coast of South America, from Cape Horn to the Isthmus of Panama and the Caribbean Sea. In absolute length (4,500 miles) no single chain of mountains approaches the Andes, and only a certain number of the higher peaks of the Himalayan chain rise higher above the sea level.

Several main sections of this huge mountain mass are distinguishable. The southern Andes present a lofty main chain, with a minor chain running parallel to it on the east, the whole extending from Terra del Fuego and the Straits of Magellan northward, and rising in Aconcagua to a height of 22,860 feet. North of this is the double chain of the central Andes, inclosing the wide and lofty plateaus of Bolivia and Peru, which lie at an elevation of more than 12,000 feet above the sea. The mountain system is here at its broadest, being about 500 miles across. Here are also several very lofty peaks, as Illampu or Sorata (21,484 feet), Sahama (21,054 feet), Illimani (21,024 feet).

Farther north the outer and inner ranges draw together, and in Ecuador there is but

one system of elevated masses, generally described as forming two parallel chains. In this section are crowded together a number of lofty peaks, most of them volcanoes, some extinct and some active. Of the latter class are Sangay (17,460 feet) and Cotopaxi (19,550 feet). The loftiest summit here appears to be Chimborazo (20,581 feet); others are Antisana (19,260 feet) and Cayambe (19,200 feet). Northward of this section the Andes break into three distinct ranges, the eastmost running northeastward into Venezuela, the westmost running northwestward to the Isthmus of Panama. In the central range is the volcano of Tolima (17,660 feet). The western slope of the Andes is generally exceedingly steep, the eastern much less so, the mountains sinking gradually to the plains.

There are about thirty volcanoes in a state of activity. The loftiest of these seems to be Gualateiri (21,960 feet) in Peru. All the districts of the Andes system have suffered severely from earthquakes, many towns having been entirely destroyed. Peaks crowned with perpetual snow are seen all along the range, and glaciers are also met with, especially from Aconcagua southward. The passes are generally at a great height, the most important being from 10,000 to 15,000 feet. At the summit of the lofty Uspallata Pass, which is a connecting point between Argentina and Chile, a noble monument called the *Christ of the Andes* has been erected to commemorate the settlement of the boundary dispute between the two countries. Most of the railroad and wagon traffic crossing the continent passes over the Uspallata trail. (See illustration, in article ARGENTINA.)

The Andes are extremely rich in the precious metals, gold, silver, copper, platinum, mercury and tin; lead and iron are also found. The animal and plant life of the Andes is abundant and varied. In these mountains are towns at a greater elevation than anywhere else in the world, the highest being the silver mining town of Cerro de Pasco (14,270 feet), the next being Potosi.

ANDOR'RA, or ANDORRE, a small, nominally independent state in the Pyrenees, with an area of about 175 square miles and a population of about 6,000. Next to San Marino it is the world's smallest republic. It has been a separate state for 600 years, is governed by its own civil and criminal codes and has its own courts of justice. The laws are administered by two judges, one of whom is chosen by France, the other by the Bishop of Urgel, in Spain. The chief manufacturing industry is the making of coarse cloth. A great extent of pasture land makes the rearing of sheep and cattle a profitable industry, and the cultivation of vines and fruit trees is also carried on. The country has rich iron mines. The village of Andorra, with a population of about 1,000, is the capital.

ANDOVER, MASS., a town in Essex County, of considerable importance as an educational center. It is the seat of Andover Theological Seminary, one of the oldest and most famous of American divinity schools, and of Phillips Academy for Boys, known usually as Phillips Andover. The latter, like the sister academy at Exeter, Mass., holds first rank among boys' preparatory schools, and has enrolled many students who have attained fame. It has an average annual attendance of 550.

The town is pleasantly situated in the Merrimac Valley, twenty-three miles north of Boston, and on the eastern bank of the Shawsheen River. It is served by the Boston & Maine Railroad, and is a manufacturing center of some importance. The place was settled in 1643, and the town was incorporated in 1646. It was the birthplace of Elizabeth Stuart Phelps Ward; Harriet Beecher Stowe also lived here for a time. Population, including several villages, in 1910, 7,301.

AN'DRE, JOHN (1751–1780), a major in the British army during the Revolutionary War. Employed to negotiate the treason of the American general, Arnold, and the delivery of the works at West Point, he was taken September 23, 1780, within the American lines, declared a spy and hanged October 2, 1780. His remains were taken to England in 1821 and interred in Westminster Abbey, where a monument has been erected to his memory. Much sympathy was felt for him in the patriot army, but military jurists are agreed that his punishment was merited and necessary. His own letter to Washington was so frank an admission of guilt as to warrant his conviction, and his one chance of escape was destroyed by the British refusal to surrender Arnold. André's personal characteristics made him a universal favorite.

ANDREE, *ahn'dray,* SALOMON AUGUST (1854–1897), a distinguished Swedish civil

engineer and scientific aëronaut, who proposed in 1895 to make a journey to the North Pole by balloon. He constructed a balloon that would hold gas for three months, with provision to refill if necessary, and buoyant enough to carry three persons, with provisions and apparatus. In 1897 Andrée with two companions left Spitzbergen on an expedition to the north polar regions, and they have not been heard of since. Several expeditions went in search of the unfortunate aëronauts, but no trace of them was found.

AN'DREW, an apostle, brother of Simon Peter, and, like his brother, a fisherman of Galilee. He was originally a disciple of John the Baptist and is supposed to have been Christ's first disciple. According to tradition, he preached in Scythia, Achaia, Colchis and Epirus. There is no mention made of him in the *Acts of the Apostles*, but there are four important references to him in the gospels.

ANDREWS, Elisha Benjamin (1844–1917), an American educator, born as Hinsdale, N. H. He served in the Union army during the Civil War and rose to the rank of second lieutenant. After completing his education at Brown University and Newton Theological Institution, he became professor of history and political economy at Brown, from which he was appointed to the chair of political economy and finance in Cornell University. After retaining this position for nine years, Professor Andrews was elected president of Brown University, and under his administration the efficiency and scope of work in this institution were largely increased. Later he became superintendent of the public schools of Chicago, and after two years resigned to become chancellor of the University of Nebraska. In 1909 he retired from active service because of failing health. He is the author of *Institutes of General History, Institutes of Economics* and *A History of the United States in Our Own Times.*

ANDROMACHE, *an drom'a kee*, in Greek mythology, wife of Hector, one of the most attractive female characters of Homer's *Iliad.* The passage describing her parting with Hector when he was setting out to his last battle is well known and much admired. Euripides and Racine have made her the chief character of tragedies.

ANDROM'EDA, in Greek mythology, daughter of the Ethiopian king Cepheus and of Cassiopeia. Cassiopeia boasted that her daughter surpassed the Nereids, if not Juno herself, in beauty, and the offended goddesses prevailed on their father, Neptune, to afflict the country with a horrid sea-monster, which threatened universal destruction. To appease the offended god, Andromeda was chained to a rock, but was rescued by Perseus. After death she was changed into a constellation.

AN'DROS, Sir Edmund (1637–1714), an English colonial governor in America. He was first made governor of New York in 1674, and there made a creditable record for honesty and ability, though he finally was removed because of political quarrels. He then became governor of New England, which had been made into one province, and from 1686 to 1689 he ruled with unprecedented tyranny. It was during this administration, when he made his famous expedition to Hartford to demand the Connecticut charter, that that instrument was hidden in the so-called Charter Oak. He was finally removed in 1688, but three years later became governor of Virginia, where he served for six years with satisfaction.

ANDROSCOG'GIN, a river of Maine, formed by the junction of the Magalloway and a small stream flowing from Umbagog Lake. It flows in an irregular course southward and enters the Kennebec. Its length is 160 miles.

ANEMOGRAPH, *a nem'o graf*, an apparatus attached to a wind vane or anemometer to make it self-recording. The most common form of anemograph consists of a cylinder moved by clock-work. The cylinder is covered by a paper ruled in squares. The vertical lines indicate the hour and minute spaces and the horizontal lines the velocity of the wind per hour. As the cylinder revolves a pencil registers the velocity of the wind. See Anemometer.

ANEMOMETER, *an e mom'e ter*, an instrument for measuring the force and velocity of wind. The instrument which has yielded the best results and is in most general use consists of four hemispherical cups attached to the ends of equal horizontal arms crossing at right angles and attached at their center to a vertical axis which turns freely. The lower end of this axis contains an endless screw which meshes into a train of wheelwork. When the disk revolves it causes a needle to move over a cylinder which is turned by

clock-work. This cylinder is covered with a graduated paper divided by vertical lines into hour and minute spaces and by horizontal lines into spaces indicating the velocity of wind in miles per hour. The cylinder is so graduated that its rotation corresponds to the movement of the hour hand of a clock. By means of this apparatus the velocity of the air current can be recorded for each hour and minute of the day.

The velocity of the wind is from two and one-half to three and one-half times that of the cups in the anemometer. This being known, the calculation of the velocity from the readings of the instrument is very simple. In city stations of the weather bureau, anemometers are placed on the tallest buildings, where the currents of air are free from obstruction. For this reason the velocity of wind measured will always be a little more than that of the current at the surface of the earth, because of the resistance encountered.

ANEM'ONE, or **WIND FLOWER**, a name given to many species of plants belonging to the crowfoot or buttercup family. The *wood anemone* is a common wild flower of the eastern United States; the *pasque flower* in earliest spring adorns the wooded hills of the middle states, and a large number of beautiful species in various countries have been cultivated for a long time. Many showing a great variety of brilliant colors have been developed to a large size, and in some species the petals are very numerous, making a solid flower as double as the rose.

ANEMONE

ANESTHETIC, *an es thet'ik*, anything used for the removal of pain, especially in surgical operations, by deadening sensibility, either locally or generally. Various agents have been employed for both of these purposes, from the earliest times, but the scientific use of anesthetics may be said to date from 1800, when Sir Humphry Davy made experiments with nitrous oxide, or laughing gas, and recommended its use in surgery. In 1818 Faraday established the anesthetic properties of sulphuric ether, but this agent was not used practically with success until about twenty-six years later, when two American dentists began to use it in the extraction of teeth and in other surgical operations. In 1848 a Scotch physician, Sir James Y. Simpson, made known the value of chloroform as an anesthetic, and since that time the general field of anesthetics has vastly broadened. This agent has since been extensively used, though the use of ether still largely prevails in the United States.

In their general effects ether and chloroform are very similar; but the latter tends to enfeeble the action of the heart, while the former weakens the lungs. For this reason great caution has to be used in administering chloroform, where there is weak heart action. Local anesthesia is produced by isolating the part of the body to be operated upon, and producing insensibility of the nerves in that locality. One method is to apply a spray of ether, which, by its rapid evaporation, chills and freezes the tissues and produces complete anesthesia. A valuable local anesthetic now employed is cocaine, which enables the surgeon to perform small operations on such delicate organs as the eye or ear. Another local anesthetic widely used in dentistry is a mixture of nitrous oxide and oxygen. It is chiefly valuable in the extraction of teeth.

During the World War the use of agents to deaden pain was a means of saving countless lives. Nikalgen, a mixture of quinine, hydrochloric acid and urea, was much employed by the allies in their base hospitals. This drug, the invention of Gordon Edwards of San Francisco, is sprayed on open wounds. See SURGERY.

ANGEL, *ayn'jel*, one of those spiritual intelligences who are regarded as dwelling in heaven and employed as the ministers or agents of God. Scripture frequently speaks of angels, but with great reserve, Michael and Gabriel alone being mentioned by name in the canonical books, while Raphael is mentioned in the Apocrypha.

ANGEL FISH, known in America as the monk fish, a fish nearly allied to the sharks, very ugly and voracious, preying on other fish. It is from three to four feet long, and takes its name from its pectoral fins, which are very large, extending horizontally like wings when spread. This fish connects the rays with the sharks, but it differs from both

in having its mouth placed at the extremity of the head. It is found in tropical seas, in the Mediterranean and in the warmer parts of North America.

ANGELICO, *an jel'i co,* FRA (1387–1455), the common name of FRA GIOVANNI DA FIESOLE, one of the most celebrated of the early Italian painters. He entered the Dominican Order in 1407, and was employed by Cosmo de Medici to paint the Convent of San Marco and the Church of Saint Annunziata with frescoes. These pictures gained him so much celebrity that Nicholas V invited him to Rome to ornament his private chapel in the Vatican and offered him the archbishopric of Florence, which was declined. Angelico stands as the type of the purely religious painter. His works were considered unrivaled in finish and in sweetness and harmony of color, and were made the models for religious painters of his own and succeeding generations. The best of his work is now to be seen at Rome, in the Vatican, and in the frescoes at San Marco, in Florence, and many of his paintings are found in the galleries of Europe. *The Last Judgment,* the *Madonna of the Star* and the *Coronation of the Virgin* are examples of his art. See MADONNA.

ANGELL, *ayn'jel,* JAMES BURRILL (1829–1916), one of the greatest of American educators, for thirty-eight years active president of the University of Michigan. He was born in Scituate, R. I. In 1849 he was graduated from Brown University, then traveled and studied for two years in Europe, and after his return was appointed to a professorship at Brown University. From 1860 to the close of the Civil War Professor Angell was editor of the *Providence Journal;* in 1866 he was elected president of the University of Vermont. Five years later he accepted the presidency of the University of Michigan, and under his administration this institution broadened and developed, until now it stands in the front rank of American universities. In October, 1909, he retired from active service.

JAMES B. ANGELL

In addition to his work as an educator, Dr. Angell held various displomatic positions. From 1880 to 1881 he was United States minister to China; in 1887 he was made a member of the Anglo-American International Commission on Canadian Fisheries. In 1897 he was appointed minister to Turkey, but he returned to the University of Michigan in the following year. He wrote a *Manual of French Literature, Progress of International Law* and numerous contributions to the leading periodicals of the country.

ANGELUS, *an'je lus,* a prayer recited by the Roman Catholics at morning, noon and evening at the ringing of the angelus bell. The name comes from the opening words of the prayer, *Angelus Domini nuntiavit Mariae.* The devotion is in memory of the annunciation to the Virgin Mary by Gabriel that she should be the mother of Christ. The custom at present is to say the prayer at 6:00 A.M. and 6:00 P.M. In a famous picture called *The Angelus,* J. F. Millet (1859) represented two peasants stopping their work in the field at the sound of the bell. Millet sold the picture for a small sum. The American Art Association purchased it for 580,000 francs (about $116,000) and exhibited it in the United States, and M. Chanchard bought it in 1890 for $150,000. For a reproduction of this famous canvas, see the article PAINTING.

ANGINA, *an ji'na,* **PECTORIS**, or **HEART SPASM**, a disease characterized by an extremely acute pain, felt generally in the lower part of the sternum, and extending along the whole side of the chest and into the corresponding arm. Other symptoms are a sense of suffocation, faintness and apprehension of approaching death. The attacks rarely occur before middle age, are more frequent in men than women, and generally indicate organic heart disease.

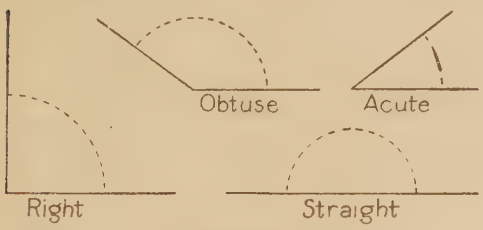
ANGIOSPERMS, *an'je o spurmz,* the most important of the two great classes into which plants are divided. This plant group embraces about 140,000 species, and forms the most prominent part of the vegetation of the earth. Angiosperms are of all sizes, varying from minute water plants to gigantic trees. The name is derived from Greek words meaning vessel and seed, and refers to the fact that the seeds are enclosed in a seed case, in contrast with the exposed seeds of the *gymnosperms.* Cross fertilization is

effected among the angiosperms not by the wind, but by various insects which carry the pollen from the stamens to the pistils. This fact is to a large extent the cause of the great variety in the structure of the flowers belonging to this group.

There are two great divisions of the angiosperms, the monocotyledons, or endogens, and the dicotyledons, or exogens (see BOTANY). To the former division belong such forms as grasses, palms, lilies and orchids, and to the latter, common trees, buttercups, roses, mints and others.

AN'GLE, a portion of space lying between two lines which meet at one point, or between two or more plane surfaces meeting at a common point or line. The point where the lines meet is the *vertex*.

A *plane* angle is the portion of a plane surface that lies between two straight lines meeting at a common point. The magnitude of a plane angle depends upon the relative



ANGLES

direction of its sides; if they are widely different in direction it is a large angle. The size of the angle is measured in degrees, a degree of angular measure corresponding to $\frac{1}{360}$ of the circumference of a circle whose center is the vertex of the angle.

A *right* angle is an angle of 90°.

An *acute* angle is an angle of less then 90°.

An *obtuse* angle is one of more than 90° and less than 180°.

A *reflex* angle is an angle of more than 180°.

AN'GLER, FROG FISH or **SEA-DEVIL**, a remarkable fish often found on the British coasts. It is from three to five feet long; the head is very wide, and both jaws have bands of long, pointed teeth inclined inward. Upon its back are spines, and around its head are fringed appendages resembling seaweed. It is also supplied with three long, bright-colored filaments which it throws out as bait to its prey. The *American angler, fishing-frog* or *goose-fish*, of the Atlantic, is from two to three feet long; it is exceedingly voracious, and its wide mouth allows it to

ANGLER

swallow fish about as large as itself.

AN'GLES, a Low German tribe, who in the earliest historical period lived in the district about Angeln, in the duchy of Schleswig. In the fifth century they crossed over to Britain along with bands of Saxons and Jutes, and colonized a great part of England and a portion of the Lowlands of Scotland. The Angles formed the largest body among the Germanic settlers in Britain, and founded the three kingdoms of East Anglia, Mercia and Northumbria. From them England takes its name (Angle-land.)

AN'GLICAN CHURCH, a term which, strictly, embraces the Church of England and the Protestant Episcopal churches in Ireland, Scotland and the colonies, but which is sometimes used to include also the Episcopal churches of the United States. The doctrines of the Anglican Church are laid down in the Thirty-nine Articles, and its ritual is contained in the *Book of Common Prayer*. Within the body there is room for considerable latitude of belief and doctrine, and three sections, differing upon these grounds, are sometimes spoken of by the names of the High Church, Low Church and Broad Church.

ANG'LIN, MARGARET (1876–), an American actress who has worked consistently for the artistic advancement of the drama. She was born at Ottawa, Canada, the daughter of a Canadian parliamentarian. After her initial appearance in 1894, in the Cival War play *Shenandoah*, she progressed steadily in popularity and dramatic skill, and was leading lady for James O'Neil, Edward H. Sothern, Richard Mansfield and other well-known actors. Among her marked successes were the leading roles in *The Great Divide, The Awakening of Helena Richie, Green Stockings, Lady Windermere's Fan, Beverly's Balance* and *Billeted*. The latter, produced in 1917–1918, was one of the most successful of the many plays based on the

World War. Miss Anglin has also appeared in revivals of the plays of Euripides and Sophocles, and has portrayed with great charm many Shakespearean parts. In private life she is Mrs. Howard Hull.

ANGLING. See FISHING.

AN'GLO-SAX'ONS, the name commonly given to the nation or people formed by the amalgamation of the Angles, Saxons, Jutes and other German tribes who settled in Britain in the fifth and sixth centuries after Christ. These tribes, who were thus the ancestors of most of the English-speaking nationalities, came from North Germany, where they inhabited the regions about the mouths of the Elbe and the Weser.

ANGO'LA, a Portuguese territory in Western Africa, lying south of the Congo. It has an area of 500,000 square miles. The principal town is the seaport of Loanda, which was long the great Portuguese slave market. The chief exports of Angola are ivory, palm oil, coffee, fish, gum, wax and cotton. Population, about 4,000,000.

ANGO'RA GOAT, a small goat native to the vicinity of Angora, Asiatic Turkey. The pure-blood Angora has a coat of soft, silver-white, silky hair, which is greatly prized as the material from which mohair and other fabrics are made. The horns of the animal are in the form of a spiral. By means of interbreeding a larger and stronger goat than the original Angora has been produced, and it has been successfully introduced into America. Besides furnishing material for mohair, Angoras are of value because of their skins, which are used to make leather, and for their milk and flesh.

ANHALT, *ahn'halt,* previous to 1919 a duchy of the German Empire, surrounded by Prussia. Its area is 886 square miles, and it is divided into two large and four smaller parts, which are all detached from one another. It is one of the oldest duchies of Europe, and the reigning family has been in power for several centuries. Anhalt is an agricultural country, and the chief crops are wheat and other grains, flax, potatoes, tobacco, hops and fruits. The mountainous regions afford a good supply of minerals. There are iron works and other manufactures. Population, 1910, 331,128.

ANILINE, *an'il in,* a substance used extensively as the basis of a number of brilliant and durable dyes. It is a colorless, oily liquid, somewhat heavier than water, with a peculiar, vinous smell and a burning taste. When acted on by arsenious acid, bichromate of potassium, stannic chloride and other substances, aniline produces a great variety of compounds, many of which are very beautiful. It is found in small quantities in coal tar, but the aniline of commerce is obtained from benzene or benzole, a constituent of coal tar, consisting of hydrogen and carbon. Benzene, when acted on by nitric acid, produces nitro-benzene; and this substance again, when treated with hydrogen at the moment the latter is being made, usually by the action of acetic acid upon iron-fillings or scraps, produces aniline.

The manufacture of aniline, or coal tar, dyes as a branch of industry was introduced in 1856 by Perkin of London. Since then the manufacture has reached large dimensions. Previous to the World War Germany attained world-wide supremacy in the manufacture of dyes, but during the war American chemists and manufacturers succeeded in establishing the industry in their own country on a sure and independent basis. See COAL TAR.

AN'IMAL. The simplest forms of animal life consist of one cell only, and bear very strong resemblances to the lowest orders of plant life. This simple cell is sensitive to outside influences and has the power to do in itself, without any special organs, all things necessary for its life. The higher orders of animals are composed of many, many cells, and have whole sets of most intricate organs, each with its special work to do; for instance, one set of organs is employed in the collection of food, another in its digestion, others in carrying the food through the body, bringing air into the system, carrying off waste and dead matter, and so on. In different animals these organs vary greatly but their purposes are the same.

By form alone no true distinction can be made between plants and animals, even in many of the higher organisms, nor are their chemical characters more distinct. It is impossible to say that the power of motion belongs exclusively to animals, for some plants can move and many animals are rooted or fixed. The great distinction between plants and animals lies in the nature and mode in which they assimilate food. Plants feed on inorganic matters, and can, with few exceptions, take in food which is presented in the liquid or gaseous state only. Animals, on

ANIMALS SHOWING ORDERS

Bats
1, Vampire Bat.
Four-Handed Animals
2, Baboon.
3, Monkey.
Pouched Animals
4, Opossum.
5, Kangaroo.
Toothless Animals
6, Giant Ant-Eater.
Thick-Skinned Animals
7, Rhinoceros.
8, Elephant.
Whales
9, Greenland Whale

ANIMALS SHOWING ORDERS

Dog Family
1, Dog.
2, Fox.
3, Wolf.

Cat Family
4, Domestic Cat.
5, Wild Cat.

Rodents or Gnawers
6, Squirrel.
7, Hare

Horse Family
8, Horse.
9, Zebra.

Ox Family
10, Deer
11, Bison.
12, Ox.

the contrary, require organic matter, and so are dependent upon plants or upon other animals for food.

Again, animals are dependent upon a proper supply of oxygen for their life, but plants require carbonic acid, which is generally poisonous to animals. Animals receive the food into the interior of their bodies and assimilation takes place in their internal surfaces; but plants receive the food into their external bodies and effect assimilation in the external parts, for instance, in the leaf-surfaces, under the influence of sunlight. All animals require a certain degree of temperature, which in the birds and mammals is considerably elevated, varying from 96° to 100° F.

Lessons on Animals. Lessons of this character are an interesting and profitable phase of nature study, and can be introduced into school work in all grades. The following suggestions will prove helpful:

All children love pets. A kitten, a dog, a canary, or possibly a rabbit or a squirrel, is doubtless enshrined in the heart of every child in the class. Be guided by this interest and let the first lessons be upon some of the common animals with which the children are familiar.

If a squirrel or rabbit can be kept in a large cage in the schoolroom or in an adjoining room a few days before the lessons begin, the children will become interested in the little animal and their observations will give them facts upon which to base their first lessons.

The chief object of the lessons in the primary grades should be to lead the children to become acquainted with the needs of the animals about them and to discover how they can contribute to these needs; also to teach them to be kind to these animals and to prevent unnecessary destruction of animal life.

Type lessons on birds, insects, the ant, the bee, the butterfly, the squirrel and the dog will be found in these volumes under appropriate headings.

Related Articles. Consult the following titles for additional information:

Amphibians
Animal Intelligence
Arachnida
Birds
Carnivorous Animals
Cetacea
Crustacea
Edentata
Fish
Insects
Invertebrata
Mammals
Marsupials
Mollusca
Nature Study
Primates
Reptiles
Rodents
Ungulata
Vertebrata
Zoölogy

ANIMAL INTELLIGENCE. It is generally known that many animals possess in a greater or less degree the same senses that we ourselves have—sight, hearing, smell, touch, temperature and so on—and that many of them experience such emotions as anger, grief and joy; but it is not by any means so certain that they have even the elements of reason as we understand that term.

The sense of *touch* in man is keenest in the finger tips, the lips and the tip of the tongue. In the lower animals the regions of greatest sensitiveness are often different, and in some animals special and very delicate touch organs have been developed; as, for example, the whiskers of the cat and the long hair on the rabbit's lip, by means of which these animals can readily find their way in the densest darkness. The wing of the bat is also very sensitive to touch.

In man the sense of *taste* is keen and resides in the taste bulbs which cover the tongue and palate. In birds and reptiles the sense of taste is not very well developed. Insects recognize the difference between sweet and bitter, but do not seem to be affected by other flavors. Many animals show an instinctive dislike for certain foods, but it may be more from the sense of smell than from taste, for the two are very closely allied.

In some animals the sense of *smell* is exceedingly acute. The dog can track his master through the crowded street; the deer recognizes the presence of an enemy very quickly. But birds have little sense of smell, and reptiles also are dull in this respect. Fish differ; it is said that the shark is almost entirely dependent on his sense of smell for his food. In insects this sense is most keenly developed.

Most of the mammals and the birds have a keen sense of *hearing*. The astonishing manner in which some birds will imitate the songs of other birds testifies to the accuracy of their hearing; but fishes hear little, though it has been proved that they can hear to some extent. Certain insects hear and can distinguish sounds that are pitched higher than the human ear is able to recognize.

The keenness of *vision* possessed by birds is most remarkable. The swift, flying high through the air, detects on the ground its minute food. The eagle sees his prey from

long distances entirely beyond the range of the human eye. Some animals, such as frogs and toads, have keen vision only at short range, and fish seem to be entirely unable to distinguish prey at any great distance from themselves. It is known that certain insects distinguish between colors.

That the higher animals have *memory* is very certain; a puppy, having been stung by a bee, will ever after avoid the insect, and may even flee at the sound of its humming. Dogs are known to have recognized their masters after years of absence, and they have been known to show strong resentment after many years against an individual who mistreated them.

Animals certainly draw inferences from what they see, but apparently in purely instinctive manner. The best writers seem to doubt whether an animal can put together different facts and establish a conclusion. The extent to which the intelligence of animals goes in this direction, however, is a subject of dispute. Some writers maintain that animals really teach their young; others protest that nothing of the sort is ever done—that the actions of a bird in throwing her young from the nest are purely instinctive, and not with any thought of the young birds' welfare. Many modern writers have taken a different stand and have written exceedingly interesting accounts and imaginative histories of many animals.

ANISE, *an'is*, an annual plant, a native of the eastern Mediterranean shore, much cultivated in Spain, France, Italy and other countries, whence the *aniseed* of commerce is obtained. It has an aromatic smell, and is largely employed as a stimulant and to flavor liquors and sweetmeats. Oil of aniseed, derived from the seeds, is used for the same purpose.

ANISE

Star-anise is the fruit of an evergreen Asiatic tree and is brought chiefly from China.

ANNAM, or **ANAM**, *an nahm'*, the central province of French Indo-China, lying on the east side of the Indo-Chinese peninsula. It has an area of about 52,000 square miles and a population of more than 4,702,000. It is traversed from north to south by a mountain chain, the highest of whose peaks reach nearly 9,000 feet. The products of Annam include rice and other grains, cinnamon, sugar cane, coffee, tobacco, tea and cotton, besides many valuable woods and some silk. The buffalo is used for domestic service, and the forest and jungles abound in all the large game characteristic of India.

The government is in theory a monarchy, but it is in reality subject to French authority, exercised through resident agents at the capital. The Annamese are of Mongolian stock, but are smaller and less robust than most kindred peoples. Their language is similar to that of the Chinese, and their religion is Buddhism, though the educated classes have in large measure adopted Confucianism. The French began to interfere in the affairs of Annam in 1847 on the plea of protecting the native Christians, and by 1884 it had come fully under French dominion. The capital city is Hué, which has a population of more than 60,000; Bin-Dinh, the largest city, has a population of 74,400.

ANNAPOLIS, *an ap'o lis*, Md., settled as Providence in 1649 and renamed in honor of Queen Anne in 1708, is one of America's historic cities. It became the capital of the province in 1694 and of the state in 1788. Annapolis is known throughout the world as the seat of the United States Naval Academy (which see). It is on the Maryland and the Annapolis, Washington & Baltimore electric lines, twenty-six miles southeast of Baltimore and thirty miles northeast of Washington.

The industries are chiefly represented in oyster fishing and packing and the raising of small fruits. The state house dates from 1772, and is only one of many old colonial landmarks. Population, 1910, 8,609; in 1917, 8,769 (Federal estimate).

ANNAPOLIS ROYAL, N. S. (formerly Port Royal), a small town in Nova Scotia, on an inlet of the Bay of Fundy, with an important herring fishery. It is one of the oldest European settlements in America, dating from 1604. It was occupied by the British in the time of Queen Anne, whence the name. Population in 1911, 1,019.

ANN ARBOR, Mich., called the Athens of the West, because it is the home of the great University of Michigan, is the county seat of Washtenaw County, and is on the Ann Arbor and the Michigan Central railroads, thirty-eight miles west of Detroit.

The city is in a well-developed agricultural region, and has several manufacturing establishments of note, among them the Hoover Steel Ball Bearing Company and the Superior Manufacturing Company. There are six banks, two state hospitals, ten private hospitals (due to the medical department of the University), a Carnegie Library and the great University library.

The University buildings are worth about $4,000,000; the University Y. M. C. A., built in 1916, cost $100,000. There are private residences valued at $65,000 and $75,000. The student body of over 7,000 is not included in the population of 14,817 (1910); in 1917 it was 15,041 (Federal estimate).

ANNATTO, *an naht'to*, an orange-red coloring matter, obtained from the pulp surrounding the seeds of a shrub native to tropical America, and cultivated in Guiana, Santo Domingo and the East Indies. It is sometimes used as a dye for silk and cotton goods, though it does not produce a very durable color, but it is much used in medicine for tingeing plasters and ointments, and to a considerable extent by farmers for giving a rich color to cheese.

ANNE, *an*, (1665–1714), Queen of Great Britain and Ireland, the last of the Stuart dynasty in England. She was the second daughter of James II, formerly the Duke of York, and Anne, the daughter of the Earl of Clarendon. With her father's permission she was educated in the beliefs of the English Church. In 1683 she was married to Prince George, brother to Christian V of Denmark. On the arrival of the Prince of Orange in 1688, Anne wished to remain with her father, but was prevailed upon by Lord Churchill (afterward Duke of Marlborough) and his wife to join the triumphant party. After the death of William III in 1702 she ascended the English throne. Her character was essentially weak, and she was controlled first by Marlborough and his wife and afterwards by Mrs. Masham.

Most of the principal events of her reign are connected with the War of the Spanish Succession, through which England acquired Gibraltar. Another very important event of this reign was the union of England and Scotland, under the name of Great Britain, which was accomplished in 1707. The reign of Anne was noteworthy not only for the successes of the British arms, but also the number of brilliant writers who flourished at this time, among whom were Pope, Swift and Addison. Anne was the mother of many children, all of whom died in childhood. See STUART; SUCCESSION WARS.

ANNEAL'ING, a process to which many articles of metal and glass are subjected after making, in order that they may become less brittle. Annealing consists in heating the articles and allowing them to cool slowly. When the metals are worked by the hammer, rolled into plates or drawn into wire, they acquire a certain amount of brittleness, which destroys their usefulness and has to be remedied by annealing. Annealing is particularly employed in glass works, and consists in putting the glass vessels, as soon as they are formed, and while they are yet hot, into a furnace or oven, in which they are suffered to cool gradually. The toughness is greatly increased by cooling the articles in oil.

Related Articles. Consult the following titles for additional information:

Glass	Steel
Iron	Tempering

ANNEXA'TION, a term in international law signifying the transfer of territory from one country to another. Territory forcibly seized by a nation victorious in war is annexed by *conquest;* when one state pays another a sum of money for ceding land the transference is called annexation by *purchase;* a third class is annexation by peaceful *cession.* The ceded territory may be adjacent to a country, or be hundreds or thousands of miles away. When such cession is accomplished the nation relinquishing the territory gives up all claim to it.

On page 130 is a table of the annexations that have taken place within the past century. The list does not include any annexations that have resulted from the World War.

ANNIE LAURIE, *law'rie*, a popular Scotch song written in honor of Annie, daughter of Sir Robert Laurie of the Maxwelton family. William Douglas, its author, loved the charming girl, who was a well-known beauty, but history records the prosaic fact that she married another. Though the words were written in the seventeenth century, the familiar and beautiful air, which everyone knows, was not composed until 1836. Lady John Scott Spottiswood, of England, was the composer. The first stanza of the song follows:

Territory Annexed	Original Owner	Transfer By	Present Owner	Date of Acquisition
Alaska	Russia	Purchase	United States	1867
Alsace-Lorraine	France	Conquest	German Empire	1871
Alsace-Lorraine	Germany	Conquest	France	1918
California and New Mexico	Mexico	Conquest	United States	1848
Florida	Spain	Purchase	United States	1821
Gadsden Purchase	Mexico	Purchase	United States	1853
Guam	Spain	Conquest*	United States	1898
Hawaii	Native Kingdom	Request of self	United States	1898
Louisiana	France	Purchase	United States	1803
North West Territory (Canada)	Hudson's Bay Co.	Purchase	Canada	
Orange Free State	Boer Republic	Conquest	Great Britain	
Philippines	Spain	Conquest*	United States	1898
Porto Rico	Spain	Conquest*	United States	1898
Samoa	Native Kingdom		U. S. etc.†	
Texas	Mexico	Request of self	United States	1845
Transvaal	Boer Republic	Conquest	Great Britain	
Virgin Islands	Denmark	Purchase	United States	1917

*Guam, the Philippine Islands and Porto Rico were ceded by Spain as a result of the Spanish-American War, but the United States paid $20,000,000 to Spain in compensation.
†United States, Great Britain, Germany.

Maxwelton's braes are bonnie
When early fa's the dew,
And it's there that Annie Laurie
Gie'd me her promise true—
Gie'd me her promise true,
Which ne'er forgot will be;
And for bonnie Annie Laurie
I'd lay me doune and dee.

ANNISTON, ALA., founded in 1873 by an iron company, is the county seat of Calhoun County, sixty-three miles east of Birmingham, on branches of the Louisville & Nashville and the Southern railroads. The city is beautifully located among the Blue Ridge Mountains, in a region producing coal, iron, lumber and cotton. It has foundries, machine shops, rolling mills, locomotive and boiler works and manufactures of lumber and clay products. There are eight cotton mills. There is a Carnegie Library and there are two private hospitals. Here are located a private school for girls and one for boys. A Federal building was erected in 1905 at a cost of nearly $500,000. Population, 1910, 12,798; in 1917, 14,326 (Federal estimate).

ANNUALS, *an'u alz*, a term applied in botany to those plants whose life history is condensed into one year. Such plants sprout, put forth leaves, buds, blossoms and fruit, and die within twelve months. In this group of plants are included the pea, the bean, the tomato and numerous garden flowers. Those plants which die down to the ground in the fall, but whose roots remain alive through the winter, like the carrot, for example, must not be confused with annuals. In many cases only certain varieties of a species are annuals. The other classes of plants with respect to duration of life are the biennials and perennials. The former live two years and the latter indefinitely. See BIENNIALS; PERENNIALS.

ANNU'ITY, a sum of money paid annually. An annuity is usually provided for by the present payment of a certain sum, whereby the party making the payment, or some other person named by him, becomes entitled to an annuity. The rules and principles by which this present value is to be computed have been the subjects of careful investigation. This value, which is evidently a sum of money that will yield interest equal to the proposed annuity, depends upon several factors. If the annuity is to be perpetual, the present value will evidently depend upon the rate of interest on money; if the annuity is to be for life, the present value, obviously, is dependent upon not only the rate of interest, but the number of years the beneficiary will live, which in turn depends upon age, sex, climate and other influences. Tables of mortality (see MORTALITY, LAW OF) are therefore compiled for each district of a country, from which the average present value of different annuities at different ages can be found.

ANNUNZIO, *dahn noon'dze o*, GABRIELE D' (1864–), an Italian novelist and poet, one of the most notable literary figures of his time, and the foremost in his own country after 1900. He began serious literary work while a student in his teens, and by 1890 had published several volumes of poems. Novels and plays and more verse followed, and his output has been considerable. The author was an enthusiastic ex-

ponent of Italian nationalism, and it was partly due to his flaming appeals that Italy entered the World War in 1915. D'Annunzio himself made a record in the field of aviation as a lieutenant, and showed himself one of the most daring flyers on the Austro-Italian front.

Of the novels of d'Annunzio the most notable include *The Child of Pleasure, The Intruder, The Flame of Life* and *Virgins of the Rocks.* His plays, which have too little dramatic action to be stage successes, include *Francesca da Rimini, The Daughter of Jorio, The Martyrdom of Saint Sebastian* and *The Dead City.* The latter was written for Sarah Bernhardt. A late collection of lyrics—*Laudi*—was enormously popular in Italy.

AN'ODE, the positive pole of an electric current, being that part of the surface of a decomposing body which the electric current enters; the way by which it departs is called the *cathode.* See ELECTRICITY.

ANSO'NIA, CONN., settled in 1840 as a part of Derby, was separated from the latter in 1889 and named in honor of Anson G. Phelps. It is twelve miles northwest of New Haven, on a branch of the New York, New Haven & Hartford Railroad, and on the Naugatuck River, which is spanned by a fine bridge. The city is famed for its clock factories, and it also manufactures copper, brass and wire goods and heavy machinery. It has the Phelps Memorial Library, a Y. M. C. A. building and two parks. Population, 1910, 15,152; in 1917, 16,954 (estimate).

ANT, the common name of an insect found in all temperate and tropical zones, belonging to the insect order called *Hymenoptera,* which means *membrane-winged.* Like the bees and wasps, ants live in communities, as many as 90,000 of them having been counted in one ant-hill two feet high. Each member of a colony, whether it be one of 500 ants or of many thousands, has its own well-defined and separate part in the life of the group.

There is a great variety in the material, size and form of ant hills, or nests, according to the nature of the species. Most American ants build their nests in woods, fields or gardens, usually in the form of small mounds raised above the surface of the ground and containing numerous galleries and compartments. Some, however, excavate nests in old tree trunks. Some ants live on animal food, very quickly picking quite clean the skeleton of any dead animal they may find. In Southern Europe there are ants which feed on grain and store it up in their nests for use.

ANTS
a, worker; b, male; c, female.

During the winter time ants rest in a state of torpor and require no food. Some species live on sweet substances, especially the honey-dew which exudes from the bodies of some plant lice or aphides. Sometimes the ants herd the lice on plants, much as human beings herd cattle, and from time to time, by stroking with their antennae, draw the sweet fluid from the aphides as a cow is milked. Other insects are kept in the nests of ants and looked after in a similar manner, and certain species of ants will attack the nests of other ants, carry off their workers and compel them to serve as slaves. The marvelous intelligence of ants, and the wonderful things which they do, seem to be beyond belief. They tunnel under rivers, build bridges, unite to rescue a companion in danger, and rejoice and play like kittens.

Some species are armed with stings, others with powerful mandibles or with an acrid stinging fluid which they can throw out. It is said that when an ant of a certain species dies, all the members of its community turn out together, and in solemn march carry the dead member to a suitable place, where they dig a grave and bury the dead. After these ceremonies are over the ants return in pairs to their house. The *honey ant* secretes a peculiar honey and stores it away in its abdomen until the latter becomes so swollen as to be unmanageable; then the other ants carry the honey maker into the nest and feed it carefully. In time of need they de-

vour the honey and its maker as well. The so-called *white ants* are not true ants.

Males, Females and Workers. In every species of ants there are three distinct kinds of members in each community—the males, the females and the workers; the latter are sometimes called neuters, and they abound in much greater numbers than the other two. Every colony has at least one queen; as a rule, several. These latter are larger than other ants, are frequently more deeply colored and have very delicate wings with scaly flounces. Every queen presides over a colony of from one thousand to two thousand or more ants. The male ant of many species is winged, as is also the female.

Their courting and mating is carried on in the air, with every opportunity for romance; certainly there is known to be choice and selection as among human beings. The female loses her wings as soon as her season of egg-laying begins; the male dies by the time his progeny reach their natural form, and long before full growth is attained. The workers are charged with the safety of the eggs, later of the little ants in the progressive stages of development, and still later with that of the ants too young to protect themselves. The workers show very tender care and solicitude for the young, in this virtue not being excelled either in the animal or insect world. Besides, the workers perform every other kind of labor in their community. The males and females do not labor at all.

Lessons on the Ant. There are few things in the animal or insect world that furnish more interesting material for study and investigation than the ant. In the pages that follow we have aimed to develop many of the characteristics of these tiny insects, and believe that teachers, pupils and parents may use the lessons to great advantage. It is hoped that what may be learned here may serve as a basis for further investigation and independent research. We are asking the student and reader at the outset to provide a temporary home for the ant, such as we shall describe, and to study the ant at close range; one will then be better prepared to understand the later explanations in this article, and will develop, at the same time, zest for the work.

Simple Material Required. There will be no difficulty in securing a variety of specimens of ants for purposes of study, but some trouble will be experienced in finding specimens of a size to render careful observation a matter of ease. The ant is a very small insect; the largest of the species cannot successfully be studied without the use of a magnifying glass. Such a glass—a common microscopic lens—may be purchased for less than fifty cents, and possession of one of these is strongly recommended.

A Temporary Home for Ants. Every boy and girl who is interested in securing first-hand information about the life of ants will construct an observation house, or temporary home, for them which can be kept in any room of a residence without the slightest misgiving on the part of any member of the family. Indeed, it is quite likely that your enthusiasm in the work will spread to the entire household before the investigation has proceeded far.

If you were a learned scientist you would call this temporary home or nest a *formicarium,* which is a Latin term derived from *formica,* which means an *ant's nest* or an *ant hill.* It is easily constructed. Secure a glass tumbler, as deep as possible but of a width not exceeding three inches. In this place a

A TEMPORARY HOME FOR ANTS
A Formicarium.

portion of an ants' nest which you may find in your back yard, filling the tumbler about half full. Let your specimen contain as many of the little inhabitants as possible. You cannot hope to preserve the form of the nest, so make no attempt to do so. One of the interesting things you are going to ob-

serve is the rebuilding of this nest. In order to arrive at just conclusions and to draw correct inferences in the study of ants it is necessary that their circumstances and surroundings should be, as far as possible, those of nature. This artificial home should be of sufficient dimensions to insure to the little people perfect freedom of action and to enable them to meet the demands of their domestic economy and to obey with precision every prompting of instinct. In order that their movements and performances may be registered by you, as the faithful expressions of the exercise of their instinct, they should be perfectly free to act in any direction and in any manner that the suggestion of their nature may dictate.

The illustration herewith will help the youthful investigator in preparing every detail necessary to successful observation and study. The glass, with its contents, should be placed in an encircling trench filled with water, to prevent escape of the insects.

Ants very much dislike light in their nests, probably because it makes them feel insecure, yet this statement must not be accepted as meaning that they always shun the light. At times, they seek the light with every manifestation of pleasure, but their nests are so arranged that light is excluded. This is doubtless for sanitary and protective reasons. Such an arrangement is demanded in order to promote the health of the colony, to provide safe retreats in case of heavy rains or violent causes of disturbance, to forward the development of the young, which are very sensitive to changes and degrees of temperature, and to make preparation for their long winter sleep. The different species of ants pass the winter months in suitable chambers many inches below the surface of the ground. Therefore, in preparing the new home for your captives, wrap a dark cloth around the tumbler and remove it only for purposes of observation. Leave the top usually uncovered. Place on top of the material in the tumbler a few fine crumbs of bread, part of a pulverized nut meat and possibly a drop or two of honey.

Within a day or two you should be able to answer most of the following questions if you have been observing:

1. What change has been wrought in the appearance of the nest?

2. Under your magnifying glass do you note differences in the appearance of the little inhabitants?

3. Have you seen ants carrying tiny burdens up from the depths and depositing them for a time in the sunshine and warmth and later returning below with them?

4. Have you noticed any ants with wings engaged in work?

5. To what extent have you observed that ants are attracted by light and heat?

6. Have you noticed any dead members of the colony?

For your encouragement we are going to answer the above questions. Note whether your experience coincides with the views we set forth. If not, continue your inquiries and submit your ant home to various experiments:

1. The portion of the ant hill thrown into the tumbler has assumed new forms; there are winding avenues and little grottoes visible, and we may assume that the same formations extend to those sections which are not visible to us. The ants have constructed their home.

2. There are three kinds of ants; doubtless all of them are represented in your tumbler. They are males, females and workers. We shall learn that males and females have wings at one stage of their existence but do not possess them all their lives; the workers are wingless.

3. If you have noted these tiny burdens you doubtless wonder what they are. The ants perfoming this service are the workers; the burdens are eggs. These are continually carried back and forth from the depths below to the sunshine and to the warmth. In the process of development of the ant from the egg you will learn later that before the insect assumes its final form it is called larva and pupa; the same devotion is shown in the care of these.

4. You may look wherever you can find nests of these insects but will never discover a winged ant working.

5. To prove that ants are attracted by light because of the heat with which it is associated, place a candle close to the glass home in order to illumine its chambers. The glass becomes warm and thus a source of heat. The ants flock to that part of their new home, and even if you remove the source of the heat the glad and willing movements of your little friends are not checked but are still directed to those chambers of their home which were recently illumined but are now again in comparative darkness. If you leave the ants near a fire for some time, the side nearest the heat is always crowded with ants, even though a screen intervenes. The screen does not admit luminous rays to their home but it is transparent to radiant heat. Place your glass in the sun, and the ants are certain to be attracted to the surface, where they manifest signs of pleasure and satisfaction; when the sunbeams fall upon the screen which covers the sides of the glass vessel the ants gather in the chambers and passages below, and bring up with them not only the larvae and

the pupae, but the eggs also, that all may benefit by the genial warmth.

6. What disposition is made of the dead? In their artificial home there is not an excellent opportunity to show the ants' veneration for their dead, but you may possibly learn something about it if you will place a little square box made of paper (not over one inch square and about one-fourth of an inch high) on top of the nest. It is likely to be used for a cemetery.

The things you have already observed regarding these wonderful insects will prepare you for a brief discussion of ants which will be more readily understood because of the things thus far learned.

Meaning of Hard Words. There is a strong temptation to skip all words of a technical nature in ordinary reading and study. Especially are young people likely to do this. It is not right. You possibly follow this practice because "the words are hard," and because you "cannot understand them, anyhow." May we show how you are in error in this?

The technical words in any text are there because very long ago there was the best of reasons for applying them. They are derived largely from the Latin and the Greek, and most of them were applied when those languages were solely used by scholars. Later, when new discoveries necessitated new terms, the same languages were drawn upon, that uniformity and good order might be continued. We must conclude early in our scientific investigations that these terms cannot be altered to suit our convenience, so, whenever we find a new word, let us patiently examine it. It will soon be a common word in our vocabulary.

As an illustration, did you have much trouble with *formicarium,* which has appeared in this lesson? It was pronounced by you in the most natural way, with the accent on third syllable, and we told you from where the word came. This was done as a matter of encouragement, for you might not have searched for the meaning and derivation, although any good dictionary would offer full explanation.

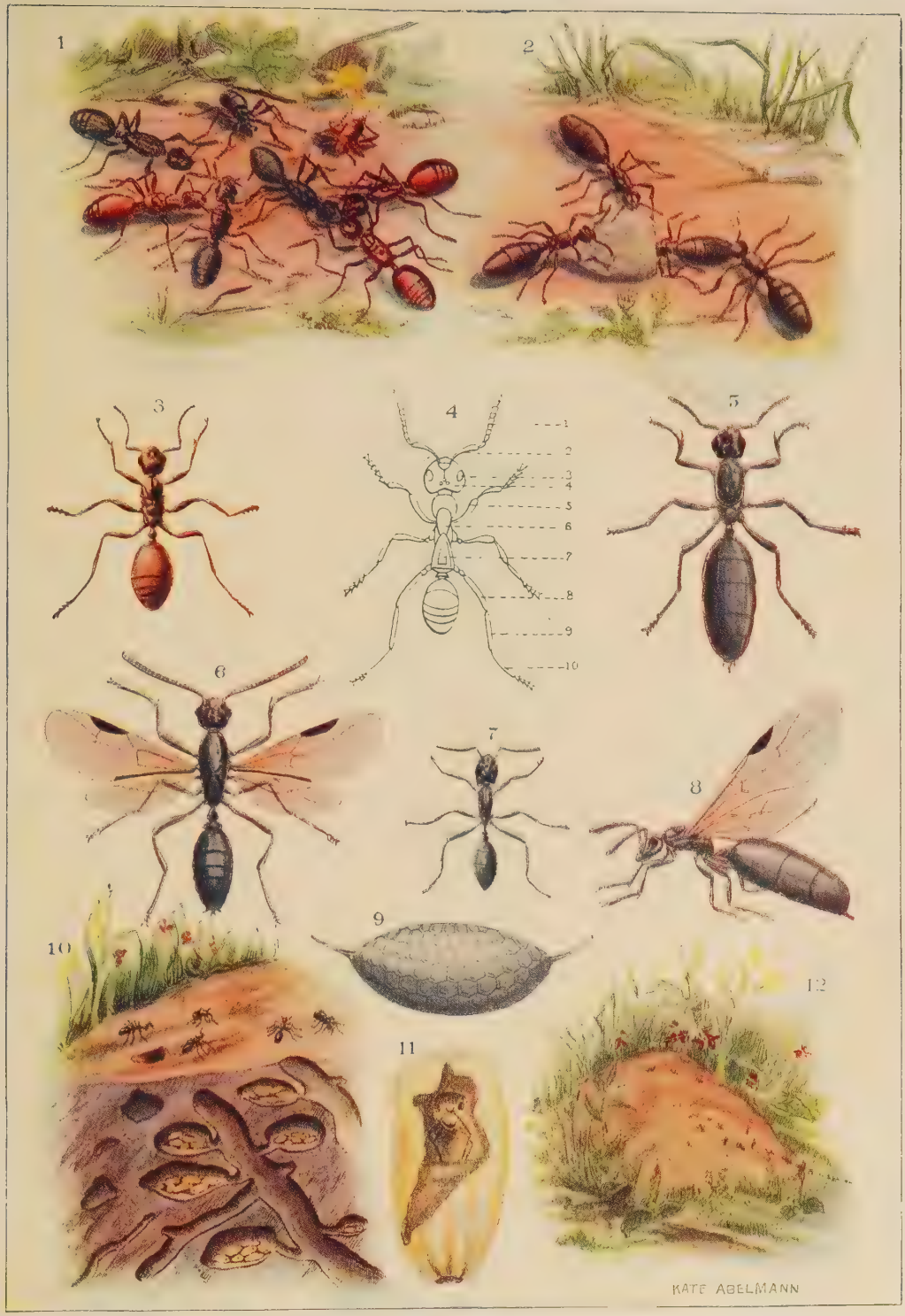
Before you read many lines further you are going to find the word *antenna,* with its two divisions, *scape* and *flagellum.* The first word is accented on the second syllable, and its last syllable is sounded like long *e;* the second is pronounced exactly as spelled; the third is accented on the second syllable, with the *g* soft; pronounce them carefully. We explain the meaning of *antenna* in the text; *scape* is a derivation from the Latin, and means *stem* or *shaft;* can you learn why? *Flagellum* is from the Latin, and our English cognate is *flagellate,* which means *to whip.* Can we imagine, then, that the *flagellum* is something that whips or beats around, striking things with which it comes in contact? There you have it; the *flagellum* is the slender part of the *antenna,* the one farthest from the body. From the definition you almost know the office this little organ performs, but it is more fully explained later.

One more word we may analyze with some care. When we read about the ant's eyes you will find the word *ocelli.* Your dictionary says it is plural in number, the singular being *ocellus.* This is from the Latin, and in form indicates the diminutive, which gives us for a definition, *little eye.* See how nicely, a little farther on, this applies.

The study of such names is extremely interesting; you can master them easily, if not too many are attempted. Note the remaining names in the diagram of the ant in the colored plate and trace the meaning of each.

Parts of the Ant. Good illustrations of the male, female and the workers are shown in the accompanying plate. The diagram of the parts of an ant should be referred to frequently. Use your magnifying glass on the inhabitants of your ants' house, locate the more important parts, and be able at all times to identify and know them by name.

The eye of the ant is a wonderful organism. If we examine the eye under the microscope we find the outer surface, which you know in all eyes as the *cornea,* is formed of a fine network of lenses similar in arrangement to the cells of the honeycomb. The eyes are immovable, hence the number of lenses, each in fact being an eye to enable the little people to see in as many directions as there are lenses in the eye. They cannot turn their eyes as human beings are able to and they do not possess the power we enjoy of altering the form of the lens so as to adapt the sight to meet the object of vision. The outer surface, or *cornea,* and the optic nerve are always at the same distance, so the ant is unable to see near objects. This is doubtless the reason why they are furnished with the sensitive and delicate feelers, with which they may, like a blind man with a stick, feel things close at hand where they are unable to see.



THE ANT

1—Battle of ants. 2—Rescuing a comrade. 3—Red ant. 4—Parts of ant [1, flagellum; 2, scape; 3, lateral eyes; 4, ocelli; 5, prothorax; 6, mesothorax; 7, metathorax; 8, femur; 9, tibia; 10, tarsus]. 5—Black ant, female. 6—Black ant, male. 7—Worker. 8—Black ant, female, with wings. 9—Portion of eye, highly magnified. 10—Cross section of ant hill. 11—Cocoon. 12—Exterior of ordinary nest or hill.

In nearly all species of ants there is one of these compound eyes on each side of the head, set far back where we would naturally expect to find ears. Most species in addition, have three simple eyes, called *ocelli,* on the exact top of their heads. In one species of ants no eyes have been discovered. These insects seem to have no settled dwelling-place, but are always on the march, searching houses for their prey, and crossing streams by forming floating bridges of their own bodies. They must be guided in their movements entirely by scent, which fact is true in great measure of every variety of ant. The ant vision seems very imperfect, and we know their sense of smell is most acute. You may test their vision by relieving an ant of a burden it is carrying; remove that burden only a very short distance and you will find the insect will have great difficulty in finding its lost treasure, though no obstacle intervenes to hide it from view.

We referred above to the feelers, or *antennae.* They are long jointed horns fixed into little sockets not far from each other, and located in the places where we would naturally expect the eyes. The word *antennae* indicates the plural number; the singular number is *antenna,* which means *feeler,* or *horn.* Each horn of the *antennae* is in two parts, the one nearer the head being the shorter. The other has, as a rule, eleven divisions, fitting into each other like little cups, looking like a string of polished beads, the last three being formed into a club. Observe this fact through your microscope. These feelers can be moved in any direction at the will of their little owner. They in no way hinder sight, since they are placed well inside the organs of vision. Since you are so well acquainted with the word *antennae,* you will be interested to know that its shorter arm is called the *scape,* and the longer one, with the eleven subdivisions, is the *flagellum.*

Now pause for a moment and reflect how easy it has been for you to master these seemingly difficult words. It will prove no more irksome to continue an inquiry into the remaining hard words in connection with the color plate. When you have completed this study you will be so interested in the general subject of ants that wider reading and research will surely follow.

Social Life of Ants. You may have to go beyond the artificial home of the ant which you have installed in your house to learn of the more intimate relation these insects bear to one another. You must have opportunity for broader observation. Could your investigation proceed far enough you would be inclined to the belief that the ant colony has a complex system of civilization, lacking little except written laws and constitution. They certainly have laws, strict and impartial, which are rigidly enforced.

If you have watched your temporary ant-hill you may have noticed how happily the members of the community seem to live together; there is harmony everywhere. The little people help each other when in need or in difficulty. When one is hungry another feeds it; when one is sickly another ministers unto it; the smaller workers of frail build or not so robust as others are borne along in the grasp of their more stalwart neighbors. When a burden is too heavy for one to carry, another comes to its aid. When separated a little while from each other the joy of the little people at meeting knows scarcely any bounds. You will not learn it from your colony, but whenever it happens that the food supply in an ant home is scarce, an unwilling victim is sacrificed to maintain the rest of the colony, in which event a foraging party unites to promote the common welfare by dragging a struggling captive to his death. This fact has often been witnessed.

Whether ants have a language by which they may communicate with each other has been decided in the affirmative. It is a silent language, yet easily translated. When alarm spreads through a colony intelligence is immediately conveyed from chamber to chamber. When it is desired to communicate the cause of fear or anger ants strike their heads against the members of their community nearest to them; these, in the same way, convey the intelligence to others, until the whole colony is in a ferment and measures of defense are quickly taken. The *antennae,* or feelers, are their chief organs of speech. By their means useful discoveries are reported, the hungry ask for food, and with them the military tribes are placed in marching order and rallied for a contest.

There is a species of ants that is always held in slavery by other species or tribes; other species are warriors and do nothing but fight. Not all ants are slave-owners, but those species known as slave-owning ants capture their prisoners in battle and keep

Questions on the Ant

Does the male ant do any work?

What are the household duties of the female?

What is done with the larvae on warm days?

Do ants tunnel under rivers and build bridges?

Of what does each community of ants consist?

Which members are wingless?

What are some of the duties of the workers?

Why are some of the workers known as soldiers?

Where and how do most American ants build their nests?

Do they require food in winter?

Why do ants sometimes herd lice on plants?

How do they draw the sweet fluid from these parasites?

What are some of their acts which show wonderful intelligence?

How do some species dispose of their dead?

Why is the *umbrella* ant so called?

How does the *honey* ant come by its name?

Name some of the peculiarities you have noticed in your observation of ants.

What are white ants?

Proportionately, how much stronger would you say ants were than some of the large animals like the bear, the elephant?

them in subjugation as effectively as once did the Roman legions.

Related Articles. Consult the following titles for additional information:

Antennae	Larva
Insects	Termites

ANTAEUS, *an tee'us*, the giant son of Neptune and Ge (the Earth), who was invincible as long as he was in contact with the earth. Hercules, challenged to combat, grasped him in his arms and stifled him suspended in the air.

ANTANANARIVO, *ahn tah nah na re'vo*, the capital of Madagascar, is situated in the center of the island on a plateau having an elevation of over 4,000 feet. The irregular streets and wooden buildings of the original town are in part replaced by modern thoroughfares and structures of brick and stone. There are several churches and cathedrals, a mosque, hospitals and schools. The most conspicuous building is the royal palace. The inhabitants are largely engaged in the manufacture of coarse textile fabrics, but the inland position of the city, combined with poor facilities for transportation, restrict the commerce to that which is absolutely necessary. Population, 72,000.

ANTARC'TIC CIRCLE, an imaginary circle, parallel to the equator and distant from the South Pole 23° 28′, marking the area within which the sun does not set when on the Tropic of Capricorn. The Antarctic Circle is about the average northern limit of the pack ice, and consequently is recognized by geographers as the limit of the Antarctic Ocean.

ANTARCTIC, *ant ahr'tik*, or **SOUTHERN OCEAN**, a large body of water around the Antarctic continent, constituting the southern ends of the Atlantic, Pacific and Indian oceans. This ocean has not been as thoroughly explored as the Arctic Ocean, and for a long time it was considered impenetrable for ships on account of the ice, which extends farther from the pole than in the Arctic Ocean. However, Amundsen and Scott penetrated it. The life of the Antarctic waters is very abundant, extending from the surface to the bottom. The deep-sea fauna is richer than the corresponding fauna of the other oceans.

Related Articles. Consult the following titles for additional information:

Amundsen, Roald	Scott, Robert F.
Ocean	South Polar Exploration

ANT'-EAT'ER, a name given to various mammals that prey on ants, though the name is usually confined to one genus of the tooth-

GREAT ANT-EATER OR ANT-BEAR

less order. In this genus the head is long, the jaws destitute of teeth, and the mouth furnished with a long extensile tongue cov-

ered with glutinous saliva, by the aid of which the animals secure their insect prey. The eyes are particularly small, the ears short and round, and the legs, especially the anterior, very robust and furnished with long, compressed, acute nails, admirably adapted for breaking into the ant hills.

The most remarkable species is the ant-bear, a native of the warmer parts of South America. It is from four to five feet in length from the tip of the muzzle to the base of the black, bushy tail, which is about two feet long. The body is covered with long hair, particularly along the neck and back. It is a harmless and solitary animal, and it spends most of its time in sleep. All are natives of South America. The name ant-eater is also given to the pangolins and to the aard-vark. The echidna of Australia is sometimes called *porcupine ant-eater.* See AARD-VARK; ARMADILLO; ECHIDNA.

AN'TELOPE, a name given to the members of a large family of mammals closely resembling the deer in general appearance, but very different in nature from the latter animals. The horns of antelopes, unlike those of the deer, are not shed annually, but are permanent and may be borne by both sexes. Antelopes, the fleetest and most graceful of animals, are shy and timid. They vary from a foot in height to the size of a horse, and in manner of life differ greatly, some living in forests and shady nooks, others in mountainous regions and others around water. At present, antelopes inhabit Asia and Africa in great numbers and are of great variety, although everywhere they are being hunted out of existence. Certain species have colors so closely resembling their surroundings that it is hard to see them. The flesh of most antelopes is considered very good, and the hides of the larger animals make excellent leather.

Among the more important species are the following: the *bushbuck,* the smallest and one of the most beautiful, called also the *harness antelope,* because of a peculiar white stripe on the body resembling a harness; the *steinbok,* a small and alert antelope, common in South Africa, reddish in color and having short ringed horns curving forward; *guevi* or *bluebuck,* a native of Africa, rarely exceeding a foot in height; the *koodoo* or *kudu,* one of the largest species, having long twisted horns and vertical stripes on the sides of its body; the *saiga* of southern Russia, having a white nose, tufts of hair beneath its eyes and ears, and a fleecy coat; the *sable antelope* of South Africa, remarkable for its shiny black coat and for the beauty of its form, and the white *oryx* of Africa, with large sword-like horns curving backward.

Related Articles. Consult the following titles for additional information:
Addax Gazelle
Chamois Pronghorn

ANTENNAE, *an ten'nee,* the feelers or first appendages upon insects, crustaceans and other animals belonging to the branch Arthropoda. The lobster has two pairs, while insects have but one. The antennae consist usually of long series of joints, sometimes more than one hundred in number, supplied with nerve branches and used by the animals for feeling their way, for testing surrounding objects and apparently for communicating with one another. Deprived of their antennae, some animals are peculiarly helpless. The antennae of moths look like feathers. On butterflies they are slender and delicate, and are tipped with little knobs. In other insects they are long and tapering, or vary widely in shape and size, as they do among the beetles.

VARIOUS FORMS OF ANTENNAE

ANTHOL'OGY, a collection of poems, epigrams or choice thoughts from various authors. Good examples of modern anthologies are Palgrave's *Golden Treasury,* Quiller-Couch's *Oxford Book of Verse,* and Stedman's *Victorian Anthology.* The name, which means a *flower-gathering,* was given to early books of this kind compiled by the Greeks, and so came in time to be applied

to all such works. The first Greek anthology was compiled by Meleager, a Syrian, about 80 B. C., and consisted largely of his own epigrams, although selections from other poets were introduced. There seems to have been no anthology of Latin writings in ancient times, but the various peoples of Asia have numerous anthologies, some of which are of a very early date.

ANTHONY, SUSAN BROWNELL (1820–1906), an American reformer, one of the early advocates of suffrage for American women. In 1918 the National House of Representatives adopted the Susan B. Anthony amendment to the Constitution, providing for equal suffrage — a great triumph for the cause which she so long championed. Mrs. Anthony was born at Adams, Mass., of Quaker parents. She taught school for fifteen years, meanwhile becoming active in the temperance and anti-slavery movements, and in 1852 she organized the first state Women's Temperance Society. In 1868 she founded *The Revolution,* a periodical devoted to the advancement of women's rights, and in 1869 organized, with Mrs. Elizabeth Cady Stanton, the National Woman's Suffrage Association, of which she was president for many years prior to 1900. Miss Anthony was arrested, tried and fined in New York in 1872 for attempting to vote, under the Fifteenth Amendment. As a lecturer she addressed audiences in all parts of England and the United States.

SUSAN B. ANTHONY

AN'THRAX, a fatal disease to which cattle, horses, sheep and other animals are subject, always associated with the presence of an extremely minute micro-organism in the blood. The disease frequently extends over large districts, affecting all classes of animals which are exposed to the exciting causes. It is also called splenic fever, and is communicable to man, appearing as carbuncle, malignant pustule or wool-sorter's disease. Thorough disinfection should follow every case. If the bodies of animals dying by anthrax are not burned, water and soil are liable to be contaminated, the poison to be carried by birds or flies, and the terrible disease communicated to human beings.

ANTHROPOL'OGY, the science of man and mankind, including the study of man's place in nature. It treats of him as animal, as a being endowed with a soul and of his relations to the rest of mankind.

Related Articles. For detailed information on this subject consult the following titles:

PEOPLES

Aino	Eskimo	Moors
Aleutian Islands	Gael	Mound Builders
subhead Aleuts	Goths	Mulatto
Angles	Gypsy	Negritos
Arabs	Helvetii	Negro
Aryan	Hottentots	Picts
Aztec	Huns	Ruthenians
Bantu	Igorrote	Sabines
Basque	Indians	Samnites
Bedouins	Jews	Saracens
Berber	Jutes	Saxons
Boer	Kaffirs	Semites
Bushmen	Kalmucks	Slavs
Cannibal	Kanakas	Slovaks
Cave Dwellers	Kirghiz	Slovenians
Celts	Letts	Tartars
Cimbri	Lombards	Teutonic Races
Circassians	Magyars	Turanian
Cliff Dwellers	Mahrattas	Turks
Copts	Mandingo	Vandals
Cossacks	Maoris	Walloons
Czech	Matabele	Zulus
Dyaks	Maya	
	Mongols	

For different tribes of American Indians, see the article Indians, American.

CUSTOMS AND INSTITUTIONS

Blood, Avenger of	Nomad Life
Blood-money	Ordeal
Cannibal	Polygamy
Caste	Slavery
Fetish	Taboo
Harem	Tattooing
Marriage	Vendetta
Names, Personal	

GENERAL

Age	Geology
Age of Man	Iron Age
Archaeology	Lake Dwellings
Bronze Age	Man
Ethnography	Races of Men
Ethnology	Stone Age
Folklore	

AN'TICHRIST, a term of Biblical origin appearing in the *Epistles of Saint John* and referring to some person or institution, standing in opposition to Christianity. The term means an opposer or adversary of Christ (See *I John* II, 18–22; IV, 1–3). Many Protestant writers have made the pope or papacy antichrist, while other writers, both Catholic and Protestant, have regarded one or another of the persecuting emperors as antichrist.

ANTI-CIGARETTE LEAGUE OF AMERICA, an organization devoted to the work of lessening the use of tobacco in any form, and especially of cigarettes. In 1897, Miss Lucy Page Gaston started an organization in Chicago for the purpose of lessening smoking among the school children, and as an outgrowth of this local society has come the present Anti-Cigarette League, with more

than 500,000 members pledged to abstain from smoking. The members are mostly boys, but a large number of adults is also enrolled. The League has branches in cities throughout the United States and Canada, and also in the Panama Canal Zone. *The Boy's Companion* and a great variety of literature are published by the League in its work. Besides its work among boys, the League is prominent in promoting legislation against the sale of tobacco to minors and in creating a public opinion which shall demand the rigid enforcement of laws. See CIGARETTE.

ANTICOSTI, *an ti kahs'ti*, an island in the Gulf of Saint Lawrence, belonging to the province of Quebec. It is barren and rocky, but is a favorite resort for seal, bears and other game, and has been secured as a private game preserve by the French manufacturer of chocolate, M. Menier. Anticosti possesses valuable peat bogs, and marl is found at several points along the shore. The island has an area of 3,147 square miles and a population of about 250. Its inhabitants are chiefly lighthouse keepers and their families.

AN'TIDOTE, a substance which will neutralize the effect of a poison. Acids are chemical antidotes to alkalis and alkalis to acids. Morphine and atropine are antidotes each for the other, because their actions upon the body are opposite. There are poisons for which no antidote is known. Many things besides the administering of an antidote should be done to relieve persons suffering from poisons (see the article POISONS), but in the following list are given the names of many of the ordinary poisons, with the names of their antidotes and some means of counteracting injurious effects.

Alcohol: Use an emetic or stomach pump as quickly as possible; then give aromatic spirits of ammonia till the pulse is rapid and full; then apply heat to the extremities and cold to the head.

Ammonia: See Caustic Potash, below.

Arsenic: Give to the patient every half-hour for four doses, a tablespoon of dialyzed iron, a substance which may be obtained at any drug store. Follow this treatment by a strong dose of castor oil.

Bedbug Poison: See Corrosive Sublimate, below.

Carbolic Acid: Give Epsom salts, the chemical name of which is magnesium sulphate, or any other soluble sulphate. At the same time give large amounts of sweet oil, whites of eggs and stimulants.

Carbonic Acid Gas: Give plenty of fresh air at once. If necessary, induce respiration artificially, as described in the article Drowning. Give thirty drops of aromatic spirits of ammonia for three doses; and then every three hours for three doses, give an ounce of well diluted whisky.

Carbonic Oxide: See Carbonic Acid Gas, above.

Caustic Potash: Give diluted lemon juice, or mix two parts of vinegar with one of water and give with freedom; then give large amounts of sweet oil.

Chloral: Give the patient an emetic consisting of thirty grains of ipecac in water, and inject under the skin one twentieth of a grain of strychnine. Apply warmth, induce artificial respiration (see Drowning) and rub the body thoroughly to stimulate circulation.

Coal Gas: See Carbonic Acid Gas, above.

Cocaine: Lay the patient on his back and give whisky, with hypodermic injections of one fortieth of a grain each of strychnine.

Corrosive Sublimate: This is bichloride of mercury. The mercury salt dissolves in an excess of albumin. When an albuminate has been formed try to induce vomiting. For this purpose give an emetic of thirty grains of powdered ipecac in warm water; then give white of egg. Wash out the stomach, and later use sedatives.

Knockout Drops: See Chloral, above.

Lye: See Caustic Potash, above.

Matches: See Phosphorus, below.

Morphine: See Opium, below.

Nicotine: Use emetics; give strong tea and stimulants, and then lay the patient flat on his back.

Nux Vomica: See Strychnine, below.

Opium: Empty the stomach as quickly as possible; cause the patient to inhale ammonia, and give him every hour a half grain of permanganate of potash. Induce artificial respiration (see Drowning) and keep the patient awake; if necessary, shake him or even whip him severely about the body and the calves of the legs. Atropine injected under the skin, or tincture of belladonna given by the mouth, has a powerful effect in stimulating breathing. Coffee should also be given to a person who has taken opium.

Oxalic Acid: Chalk, whiting or even whitewash scraped from the wall should be given in quantities of water. Follow this by a dose of castor oil or Epsom salts.

Paris Green: See Arsenic, above.

Phenacetin: Give whisky and digitalis.

Phosphorus: Give an emetic promptly, and follow with a large quantity of mucilage from gum arabic; then give a strong dose of Epsom salts. Do not give fats or oils.

Rough-on-Rats: See Arsenic, above.

Strychnine: Employ the stomach pump at once; give twenty grains of zinc sulphate or thirty grains of powdered ipecac as an emetic; then twenty grains of chloral and thirty grains of bromide of sodium dissolved together in two ounces of hot water should be injected into the rectum. Convulsions may be stopped by the use of chloroform. Twenty grains of sodium bromide should be given by the mouth every hour.

Sulphonal: Empty the stomach and use artificial respiration (see Drowning). Give plenty of hot coffee as soon as possible.

Tansy: Give an emetic of thirty grains of ipecac in warm water, and follow with a dose of castor oil.

Turpentine: Give an emetic; then give plenty of mucilage from gum arabic, Epsom salts and finally a hypodermic injection of morphine.

Unknown Poison: Of course there can be no very intelligent treatment when the nature of the poison is unknown (see Poison). If the poison has been introduced by way of the mouth, use the stomach pump or an emetic. Induce artificial respiration if necessary (see Drowning). Give two teaspoonfuls of chalk in water, four eggs beaten up with a glass of milk and some whisky.

Washing Soda: See Caustic Potash, above.

White Precipitate: See Corrosive Sublimate, above.

ANTIETAM, *an tee'tam,* BATTLE OF, a struggle of the Civil War, the crucial battle in Lee's first invasion of the North. It was fought near Antietam Creek, a small stream in Maryland, fifty miles northwest of Washington, September 16 and 17, 1862, between a Federal force of 75,000 under McClellan and a Confederate force of 40,000 under Lee. Though the battle was technically a victory for neither party, the Confederates were compelled to retreat, and Washington was saved from capture. McClellan's principal lieutenants were Hooker, Sumner, Burnside, Sedgwick and Slocum; Lee's were A. P. Hill, D. H. Hill, "Stonewall" Jackson, Early, Stuart, Hood and Longstreet. More men were killed on the second day of the battle than on any other single day of the war. Military critics are agreed that Lee displayed generalship of a higher order during this battle than upon any other occasion, while McClellan made many tactical blunders. The result of the battle made possible the announcement of the Emancipation Proclamation (which see) and is considered by many, for that reason, the turning-point of the war.

AN'TI-FED'ERALISTS, a political party in the United States which originated at the time of the adoption of the Constitution. Its adherents favored the strict construction of the Constitution, states' rights and central government with limited powers. Its principal leader was Thomas Jefferson. The name of the party was later changed to Republican, Democratic-Republican, and finally to Democratic. See DEMOCRATIC PARTY.

ANTIGONE, *an tig'o ne,* in Greek mythology, the daughter of Oedipus and Jocasta, celebrated for her devotion to her father and to her brother, Polynices. For burying the latter, against the decree of King Creon, she was interred alive in a tomb. She is the heroine of Sophocles' *Oedipus at Colonus* and of his *Antigone.*

ANTILLES, *an til'leez,* a name often applied to the West India Islands as a whole. They comprise two groups, known as the Greater Antilles and the Lesser Antilles. The Greater Antilles include Cuba, Jamaica, Haiti, Porto Rico and some small islands near their coasts. The Lesser Antilles are made up of small islands. Among the best-known of these are Trinidad, Barbadoes, Martinique, Antigua and the Virgin Islands of the United States. See WEST INDIES.

AN'TIMONY, a brittle metal of a bluish-white or silver-white color. It melts at a temperature of 830° to 840° F., and burns with a bluish-white flame. A mineral called stibnite or gray antimony is the chief ore from which the metal is obtained. The ore is found in many places, including Mexico, France, Spain, Hungary, Italy, Canada, Australia and Borneo. The metal does not rust or tarnish when exposed to the air. When alloyed with other metals it hardens them, and is therefore used in the manufacture of such things as Britannia-metal, type metal and pewter. It renders the sound of bells more clear; it makes tin more white and sonorous, as well as harder, and makes the types for printing firmer and smoother. The salts of antimony are very poisonous. Protoxide of antimony is the active base of tartar emetic and is regarded as a valuable remedy. *Yellow antimony* is a preparation of antimony of a deep yellow color, used in enamel and porcelain painting. It is of various tints and the brilliancy of the lighter hues is not affected by foul air.

ANTIOCH, *an'ti ok,* a famous city of ancient times, the capital of the Greek kings of Syria. It lay on the left bank of the Orontes, about twenty-one miles from the sea, in a beautiful and fertile plain. Antioch was founded by Seleucus Nicator in 300 B. C., and named after his father Antiochus. In Roman times it was the seat of the Syrian governors and the center of a widely-extended commerce. It was called the "Queen of the East" and "The Beautiful," and was a center of Greek culture for a long

period. Its population at the height of its power was estimated at 400,000. Antioch is frequently mentioned in the New Testament; it was here that the disciples of Jesus Christ were first called Christians (*Acts* XI, 26). The Modern Antioch, or Antakiyeh, occupies but a small portion of the ancient site; its population is about 28,000.

ANTIPODES, *an tip'o deez*, a name meaning *exactly opposite*, is applied in geography to a group of small, uninhabited islands in the South Pacific Ocean, southeast of New Zealand. They receive their name from their position, for they are almost exactly halfway around the world from Great Britain.

AN'TIPOPE, the name applied to those who at different periods have produced a schism in the Roman Catholic Church by opposing the authority of the pope, under the pretense that they were themselves popes. The first antipope is reputed to be Laurentius, elected in 498 in opposition to Symmachus. Several emperors of Germany set up antipopes. After the death of Gregory XI, the French cardinals objected to the election of Urban VI and, withdrawing to Provence, set up Clement VII as antipope, thus creating in the Church what was known as the "great schism of the West." The last antipope was Felix V, a duke of Savoy (1439–1449).

ANTIPY'RENE, a white soluble powder, given often as a medicine to relieve pain. As it acts unfavorably upon the heart, it should not be taken except upon the advice of a physician, especially if the patient has a tendency to heart disease. Individuals vary in their susceptibility to the drug.

ANTI-SALOON LEAGUE, an organization founded as a state body in Ohio, in 1893, for the purpose of abolishing the liquor business. It proved to be the most effective political weapon ever devised to eliminate saloons, and spread to every state of the Union. The national headquarters are at Westerville, O., and at Washington, D. C. All political parties and all religious bodies are represented in its membership and among its officers. The activities of the League include education of the people in regard to the baneful effects of liquor, and political campaigns in behalf of dry legislation and officials opposed to liquor. See PROHIBITION; TEMPERANCE.

ANTISEP'TIC, an agent that prevents or stops decay. There are a great number of substances having this preservative property, among which are salt, alcohol, vegetable charcoal, creosote, corrosive sublimate, tannic acid, sulphurous acid, sulphuric ether, chloroform, arsenic, camphor, niter and aniline. Alcohol is used extensively in preserving specimens for museums and laboratories, and many of the poisonous substances mentioned above are satisfactory when the substance to be kept is not a food stuff. The packing of fish in ice and the curing of herring and other fish with salt are familiar antiseptic processes. The term is applied in a specific manner to that mode of treatment in surgery by which air is excluded from wounds, or allowed access only through substances capable of destroying the germs in the atmosphere. See BACTERIA AND BACTERIOLOGY; SURGERY.

ANTITOX'IN, a substance formed by natural processes in the blood of persons suffering from bacterial diseases. It possesses the power of neutralizing the poisons, or toxins, developed by the bacteria. It is the presence of antitoxins in the serum of the blood that frequently makes inoculation a preventive in bacterial diseases. Prepared antitoxins injected into the blood of diseased persons have proved of great value in the treatment of diptheria and lockjaw. See SERUM THERAPY; BACTERIA AND BACTERIOLOGY.

ANTI-TRUST LAWS, a term applied to Congressional enactments, particularly in the United States and Great Britain, to laws designed to regulate the policies of gigantic business interests. Within the few years of the twentieth century the power of some great corporations has grown to such an extent that, when abused, it has constituted a menace to the general welfare and the security of the people. Legislation on this subject is discussed in these volumes in the article TRUSTS.

ANT'-LION, the larva of an insect which in its perfect state resembles a small dragon fly. It is remarkable on account of the ingenious method by which it catches the ants and other insects on which it feeds. The ant-lion digs a funnel-shaped hole in the dryest, finest sand it can find and makes the sides smooth and sloping. Then it buries itself at the bottom of the hole with only its strong jaws visible. When some luckless ant stumbles over the edge of the hole, it rolls down the sloping sides, to be seized by the

voracious larva in waiting. As soon as the juices are sucked from the body of the prey, the ant-lion jerks it out of the hole, repairs

ANT-LION
Perfect insect and larva.

the side of the pit and is ready for another insect. If at any time the prey seems liable to escape up the sloping sides, the anti-lion washes it back by throwing sand over it.

ANTOFAGASTA, *ahn toh fa gahs'tah,* CHILE, a seaport on the Pacific coast, about 500 miles north of Valparaiso. It is an important shipping port for saltpeter, large deposits of which are near-by, and is connected by railroad with valuable silver mines. This city and the province of which it is the capital were ceded to Chile by Bolivia in 1882. Population, 1914, 36,114.

ANTONY, MARK, in Latin MARCUS ANTONIUS (83–30 B. C.), a famous Roman of the period of Julius Caesar. He served in Gaul under Caesar and in 50 B. C. returned to Rome to support Caesar's interests against Pompey. When the war broke out between these two, Antony led reënforcements to Caesar in Greece and took an important part in the battle of Pharsalia. In 44 B. C., as Caesar's colleague in the consulship, he tried to have Caesar made emperor (see CAESAR, CAIUS JULIUS).

After Caesar's assassination, Antony, by the oration which he delivered over the body, excited the people to anger and revenge and compelled the assassins to flee. Antony quarreled with Octavianus, but became reconciled to him and departed to Cisalpine Gaul, which had been conferred upon him against the will of the senate. While he was absent he was declared a public enemy, was defeated by the army of the senate and was compelled to flee over the Alps. Later, through the influence of Lepidus, Antony and Octavianus were again reconciled, and it was agreed that the three conspirators, who were called *triumvirs,* should divide the Roman world among them. Antony received Gaul; Lepidus, Spain, and Octavianus, Africa and Sicily.

MARK ANTONY

In 42 B. C. Antony and Octavianus defeated Brutus and Cassius at Philippi, and Antony then went to Asia. Here Cleopatra appeared before him to apologize for her insolent behavior to the triumvirs. Antony fell a victim to her charms and followed her to Alexandria. Hostilities which broke out in Italy between his own relatives and Octavianus recalled him to Italy, but the struggle was decided before he reached Rome. A new division of the Roman world was now made, by which Antony obtained the East and Octavianus the West. Antony returned again to Cleopatra, and some time later war was declared by Octavianus, ostensibly against Cleopatra, but really against Antony. At the Battle of Actium, Antony was defeated (see ACTIUM). He returned to Alexandria and, deceived by a false report of Cleopatra's death, fell upon his own sword.

ANT'WERP, BELGIUM, the chief port of the country and the capital of the province of Antwerp, on the Scheldt River, about fifty miles from the open sea. In 1914 Antwerp was taken by the Germans after a ten-days' siege. The outer defenses were attacked on September 29, and the city, supposed to be impregnable, surrendered on October 9. The chief credit for the capture belongs to the great Krupp siege guns, but both armies fought valiantly. The city was little damaged by the bombardment, because the Germans agreed not to shell the prominent buildings, provided these were not used for military purposes. Antwerp was liberated in 1918, and was the scene of a triumphal entry by the king and queen, November 20.

The most notable building in Antwerp is the cathedral, with a spire 400 feet high. It is one of the largest and most beautiful specimens of Gothic architecture in Belgium, and contains Rubens' celebrated masterpieces—the *Descent from the Cross,* the *Elevation of the Cross* and *The Assumption.* The other churches of note are St. James's, Saint Andrew's and Saint Paul's, all enriched with paintings by Rubens, Vandyck and other masters. Important secular buildings include the handsome town hall, the Museum Plantin-Moretus and various schools. The

harbor is one of the finest in the world, and previous to the World War nearly 17,000,000 tons of shipping entered and cleared the port yearly. There are numerous and varied industries, among which are sugar refining, distilling, lacemaking and shipbuilding. Population, 1912, 312,884.

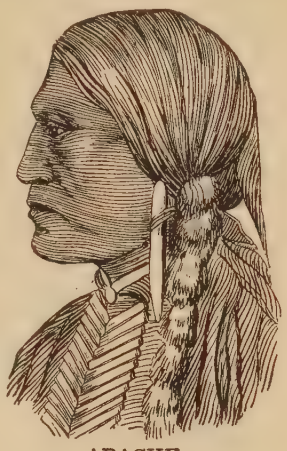
ANU'BIS, one of the deities of the ancient Egyptians, the son of Osiris by Isis. His office was to conduct the souls of the dead from this world to the next.

ANUBIS

AN'VIL, an iron or steel block on which pieces of metal are laid for the purpose of being hammered. The common smith's anvil is generally of seven parts, namely, the *core* or *body;* the four corners for the purpose of enlarging its base; the projecting end, which contains a square hole for the reception of a set or chisel to cut off pieces of iron; and the *beak* or conical end, used for turning pieces of iron into a circular form. These parts are each separately welded to the core and hammered so as to form a regular surface with the whole. When the anvil has received its final form, it is faced with steel, and is then tempered in cold water.

AOR'TA, the great artery, the trunk of the arterial system of the body. It rises from the left ventricle of the heart toward the top of the breastbone; then it makes a curve, called the *arch of the aorta,* whence it gives off branches to the head and upper extremities; then going downward through the chest, it gives off branches to the trunk. Thence it passes through the diaphragm and finally divides into the two iliacs, which supply the pelvis and lower extremities. See ARTERIES; CIRCULATION; HEART.

APACHE, *a pah'cha,* a warlike tribe of Indians whose former home was in Arizona, New Mexico and the northern states of Mexico. Ages ago they migrated from the vicinity of the Great Slave Lake in Canada, and became the veritable Ishmaels of the West. For years they carried on a guerrilla warfare with settlers and troops. Their leader, Geronimo, was captured by General Miles and, with other hostile Indians, kept as a prisoner. Civilization is slowly benefiting the Apache on the San Carlos and White Mountain reservations in Arizona. One highly educated Indian, Antonio Apache, was one of the officials of the department of anthropology at the World's Columbian Exposition in Chicago, 1893. The Apaches are skilful in the manufacture of baskets and pottery. The number of Apaches, most of whom live on reservations in Arizona and New Mexico, is now 5,000.



APACHE

APE, a name commonly given to any of the family of mammals to which the monkey belongs. The term is limited, strictly, to the *anthropoid,* or manlike, monkeys. This family includes the chimpanzee, the gorilla, the orang-utan and the gibbon, some of which are larger and stronger than man. The skeleton closely resembles that in man, the difference being mostly in the proportion of the limbs, the shape of the cranial and facial bones and the spinal column. The legs are shorter than in man, the arms longer, the skull thicker, the jaws square rather than rounded and the spinal column not curved at the base. The feet are similar to those of man, though the big toe is somewhat like a thumb, and the foot can clasp things like a hand.

The brain is only half as large as man's, but is similar in almost all other respects. In muscles, nerves and all the bodily organs, man and the apes are practically the same. But the bodies of the apes, excepting the face, the palms of the hands and the soles of the feet, are covered with coarse black or brown hair. The food of the ape is vegetable, largely fruits, and its home is built on a rude platform constructed in the trees of the tropical forests.

Related Articles. Consult the following titles for additional information:

Baboon
Chimpanzee
Gibbon
Gorilla
Monkey
Orang-utan

APELLES, *a pel'leez,* the most famous of the painters of ancient Greece and of antiquity, was born in the fourth century B. C., probably at Colophon, in Asia Minor. Ephorus of Ephesus was his first teacher, but, attracted by the renown of the Sicyonian school, Apelles later went to Sicyon to study. In the time of Philip he went to Macedonia and there a close friendship between him and Alexander the Great was established. His portrait of Alexander with a thunderbolt in his hand was one of his most celebrated paintings. The drawings of Apelles are especially noted for accuracy in detail and delicacy of coloring. Lucian's detailed description of Apelles' works gave inspiration to the Italian Botticelli, the German Dürer and many other artists.

AP'ENNINES, THE, a prolongation of the Alps, forming the "backbone of Italy," are perhaps the most recently formed mountains in Italy. The average height of the mountains composing the range is about 4,000 feet, and nowhere do they reach the limits of perpetual snow, though some summits exceed 9,000 feet in height. Monte Corno, the highest peak, has an altitude of 9,580 feet. On the highest summit of the Northern Apennines, Monte Cimone (7,110 feet), is a meteorological observatory. These mountains consist almost entirely of limestone rocks, and are exceedingly rich in the finest marbles. On the south slopes volcanic masses are not uncommon, Mount Vesuvius, the only active volcano on the continent of Europe, being an instance. The lower slopes are well clothed with vegetation; the summits are sterile and bare. Thirteen passes pierce the Apennines.

APHASIA, *a fa'zhe a,* a symptom of certain diseases of the nervous system, in which the patient loses the power of expressing ideas by means of words, or loses the appropriate use of words, the vocal organs the while remaining intact and the intelligence sound. There is sometimes an entire loss of words as connected with ideas, and sometimes the loss of a few only. In one form of the disease, called *aphemia,* the patient can think and write but cannot speak; in another, called *agraphia,* he can think and speak, but cannot express his ideas in writing. In a great majority of cases, where post-mortem examinations have been made, morbid changes have been found in the left frontal convolution of the brain.

APHIDES, *af'i deez,* very small greenish or brown bugs, commonly known as *plant lice,* that live on the tender shoots of plants, sucking the sap through long, sharp beaks. Some of them have two minute tubes on their backs from which they excrete a sweet substance that ants and other insects like (see ANT). Aphides are injurious to plants and often become great pests. They themselves are preyed on by birds, spiders, ants and ladybird beetles.

APHRODITE, *af ro di'te,* the goddess of love among the Greeks, better known as Venus (which see).

A'PIA, the chief town and the trading center of the Samoan Islands, on the north side of the island of Upolu. In 1900, when the Samoan Islands were divided between the United States and Germany, Apia became the capital of German Samoa. In 1914, after the outbreak of the World War, it was occupied by Australian troops. Robert Louis Stevenson is buried on the summit of a mountain overlooking the town. Population, about 1,500. See SAMOA, for map.

A'PIARY, a place for keeping bees. The apiary should be well sheltered from strong winds, moisture, and the extremes of heat and cold. The hives should face the south or southeast, and should be placed on shelves two feet above the ground and about the same distance from each other. As to the form of the hives, and the materials of which they should be constructed, there are great differences of opinion. Wooden hives of square, boxlike form are now gaining general favor among bee keepers. They usually consist of a large breeding chamber below, and two sliding removable boxes called *supers* above, for the withdrawal of honey without disturbing the contents of the main chamber. It is of great importance that the apiary should be situated in the neighborhood of good feeding grounds, such as gardens, clover fields, or heath-covered hills. When their stores of honey are removed the bees must be fed during the winter and part of spring with syrup or with a solution consisting of two pounds of loaf sugar to a pint of water. SEE BEE.

A'PIS, a bull, with special venerated markings, to which divine honors were paid by the ancient Egyptians, who regarded him as a symbol of Osiris (which see). He was not suffered to live beyond twenty-five years, but was secretly drowned by the priests in a sacred well. Another bull with the sacred

marks was selected in his place, often only after a long search. His birthday was annually celebrated, and his death was followed by a season of public mourning.

APOCALYPSE, *a pok'a lips,* the name frequently given to the last book of the New Testament, in the English version called the *Revelation of Saint John the Divine.* It is generally believed that the Apocalypse was written by the apostle John in his old age (A. D. 95–97), in the Isle of Patmos, whither he had been banished by the Roman emperor Domitian.

APOCRYPHA, *a pok'ri fah,* a term applied in the earliest churches to various sacred or professedly inspired writings. The term is specially applied to the following books, which were written during the two centuries preceding the birth of Christ: The first and second books of Esdras, Tobit, Judith, the rest of the book of Esther, the Wisdom of Solomon, the Wisdom of Jesus the son of Sirach, or Ecclesiasticus, Baruch the Prophet, the Song of the Three Children, Susanna and the Elders, Bel and the Dragon, the Prayer of Manasses and the first and second books of Maccabees.

APOL'LO, son of Jupiter and Leto, and twin brother of Diana. He slew the serpent Python on the fifth day after his birth, and afterward, with Diana, he killed the children of Niobe. He also destroyed the Cyclops, because they forged the thunderbolts with which Jupiter killed Aesculapius, Apollo's son. Apollo was originally the sun god, and in later times the view was almost universal that Apollo and Helios were identical. From being the god of light and purity in a physical sense, he gradually became the god of spiritual light and purity and of political progress. He came to be regarded as the god of song and prophecy, the institutor and guardian of civil and political order and the founder of cities. His worship was introduced at Rome, probably in the time of the Tarquins. Among the ancient statues of Apollo that have come down to us the most remarkable is the one called the *Apollo Belvedere,* from the Belvedere Gallery in the Vatican at Rome. A description and illustration of this statue will be found in the article SCULPTURE.

AP'OPLEXY, the sudden loss of consciousness and voluntary motion caused by pressure upon the brain resulting from congestion or rupture of the blood vessels in that organ. In a complete apoplexy the person falls suddenly, is unable to move his limbs or to speak, and gives no evidence of seeing, hearing or feeling. His breathing is noisy, much like that of a person in deep sleep. Among the premonitory symptoms of this disease are drowsiness, giddiness, dullness of hearing, frequent yawning, disordered vision, noise in the ears and vertigo. It is most frequent between the ages of fifty and seventy. People with large heads, short necks, full chests and corpulent frames are generally considered to be more liable to apoplexy than persons of thin habit. Among the common predisposing causes are lack of exercise, worry, habitual indulgence of the temper and passions, overeating, and indulgence in too much meat, liquor or tobacco. More or less complete recovery from a first and second attack is common, but a third is almost invariably fatal.

APOSTLES, *a pos''lz,* twelve men whom Jesus selected to attend Him during His ministry and to promulgate His religion. They were Simon Peter, and Andrew, his brother; James, and John, his brother, sons of Zebedee; Philip; Bartholomew; Thomas; Matthew; James, the son of Alpheus; Lebeus, his brother, called *Judas;* Simon, the Canaanite, and Judas Iscariot. All were laboring men except Matthew, who was a tax collector. To these were subsequently added Matthias (chosen by lot in place of Judas Iscariot) and Paul. The Bible gives the name of apostle to Barnabas also, who accompanied Paul on his missions (*Acts* XIV, 14). In a wider sense the term apostles is applied to those preachers who first taught Christianity in heathen countries; for example, Saint Denis, the apostle of the Gauls; Saint Boniface, the apostle of Germany; Saint Augustine, the apostle of England. See BIBLE.

APOSTLES' CREED. See CREED.

APOSTOL'IC SUCCESSION, the doctrine according to which bishops, priests, deacons and other similar officers of the Church are believed to have received consecration from those who trace their right back to Christ's Apostles, in direct line of succession. This system is strictly observed by the Roman Catholic, the Eastern and the Anglican churches, which consider no minister legitimate unless he has been ordained by a bishop claiming this succession from the apostles. See BISHOP.

APOTH'ECARIES' WEIGHT, the weight used in dispensing drugs, in which the pound is divided into 12 ounces, the ounce into 8 drams, the dram into 3 scruples and the scruple into 20 grains, the grain being equivalent to that in avoirdupois weight and Troy weight.

APOTH'ECARY, DRUGGIST, or **PHARMACIST,** in a general sense, one who keeps a shop or laboratory for preparing, compounding and selling medicines, and for the making up of medical prescriptions. It was in Arabia that physicians first began to give up to ingenious men the preparation of medicines from prescriptions. It is probable, therefore, that many Arabic terms of the art were by these means introduced in pharmacy and chemistry, and have been still retained and adopted. In the United States one who keeps a drug store is usually called a *druggist,* while the term *pharmacist* is applied to one who has completed a course in pharmacy and is licensed to compound medicines from physicians' prescriptions.

APOTHE'OSIS, meaning *deification,* was a solemnity among the ancients by which a mortal was raised to the rank of the gods. The custom of placing among the gods these mortals who had rendered their countrymen important services was very ancient among the Greeks. The Romans for several centuries deified none but Romulus, and first imitated the Greeks in the fashion of frequent apotheosis after the time of Caesar. From this period apotheosis was regulated by the decrees of the Senate and accompanied with great solemnities. Many of the Roman emperors were deified. The term is now used generally as a synonym of *glorification* or *exaltation.*

APPALA'CHIAN MOUNTAINS, a mountain range in North America, extending for 1,300 miles, from Cape Gaspé, on the Gulf of Saint Lawrence, southwest to Alabama. The system has been divided into three great sections: the northern, including the Adirondacks, the Green Mountains and the White Mountains, from Cape Gaspé to New York; the central, including a large portion of the Blue Ridge, the Alleghanies and numerous lesser ranges, from New York to the valley of the New River; and the southern, including the continuation of the Blue Ridge, the Black Mountains and the Smoky Mountains, from the New River southward.

The chain consists of several ranges, generally parallel to one another, the altitude of the individual mountains increasing on approaching the south. The highest peak is Mount Mitchell, 6,711 feet, in North Carolina. This is the highest mountain east of the Mississippi River. Lake Champlain is the only lake of great importance in the system, but numerous rivers of considerable size take their rise here. Magnetite, hematite and other iron ores occur in great abundance, and the coal deposits are among the most extensive in the world. Marble, limestone, fire clay, gypsum and salt abound. The forests covering many of the ranges yield valuable timber. The Appalachians are examples of folded mountains, whose summits have been rounded by erosion. Most of the mountain chains mentioned are described in separate articles.

APPALACHICO'LA, a river of the United States, formed by the Chattahoochee and Flint rivers, which unite in Georgia near the northern border of Florida. The main stream flows south through Florida for 100 miles, emptying into Appalachicola Bay in the Gulf of Mexico. It is navigable throughout its course.

APPEAL, in law, the legal form by which a suit is taken from a lower to a higher court for rehearing, or for a reversal of the decision. Each system of courts has particular rules upon which appeals may be granted, usually requiring the presentation of additional material evidence, or the certification of an error in the conduct of the trial by the court. See PROCEDURE.

APPENDICITIS, *ap pen'di si'tis,* an inflammation of the vermiform appendix (which see), formerly thought to be an inflammation of the large intestine. The vermiform appendix is an organ about three inches long and a quarter of an inch in diameter in its normal condition, and is located on the right side of the abdomen midway between the crest of the ilium and the navel, though its position varies somewhat in different individuals. The organ seems now to be useless, though the more highly developed corresponding organ in some of the lower animals is of value in digestion.

Appendicitis may arise from a variety of causes, such as wounds, strains or violent injury, or the presence of some foreign body in the appendix. The last mentioned cause, once thought to be the most important, is now considered to be rarely the exciting

cause. It is probable that in a majority of cases the prime factors are bacteria acting upon an injured or weakened mucous membrane. Among the symptoms of appendicitis are sharp, colicklike pains, varied by dull aches, which gradually localize themselves in the region of the appendix. Fever follows rapidly, and is usually accompanied by nausea and vomiting.

More than half of the cases of appendicitis appear between the ages of twenty and fifty, and about eighty per cent of the patients are males. A large proportion of all cases recover, but in severe cases the tissue of the appendix ulcerates and becomes perforated, causing inflammation of the whole abdominal cavity. In cases of perforation death is almost certain to follow, unless prompt surgical measures are taken. In fact, the surgical operation has come to be considered the only certain cure for the disease, and so well known are the method of operation and the subsequent treatment of the wound, that the operation is not regarded in the least as a difficult or dangerous one.

APPERCEP'TION, in psychology, the term employed to denote the assimilation of ideas. When a new idea is presented to us, we attempt to relate it to our store of knowledge. In this attempt the mind reacts upon the idea presented to it; therefore apperception is a reaction of our mental activities upon external stimuli. The degree of effort accompanying the reaction depends upon the nature of the idea. If it is of little importance and closely related to something already well understood, the effort of apperception is so slight that we scarcely recognize it, or we may be entirely unconscious of it, as in the apperception of an apple or a ball; but if the idea is new, we bring to bear upon it all our mental powers. All similar ideas are brought into consciousness and compared with the new one, which is then classified, and if found to agree with the ideas already in the mind, is accepted. If found to disagree, it may be rejected or held in abeyance for further examination.

Before a new idea can be apperceived, we must obtain knowledge concerning it. If it is a new sort of fruit, we bring to bear upon it all the senses, such as sight, touch, taste, smell. We then attempt to learn of its manner of growth, whether the plant is annual, biennial or perennial; whether it is an herb, shrub or tree, and whether it thrives in a warm or temperate climate. When these items of information are obtained, we are prepared to classify properly the new specimen and add it to our idea of fruit.

Those ideas which affect our notions of life, such as political, social and religious truths and principles, are received with greater difficulty than ideas of material objects. This is because their reception tends to modify our settled beliefs or accustomed practices, and when they are first presented we array against them all of our habits and customs which they affect. Because of their wide influence we are often a long time in apperceiving new truths of this sort. However this is not wholly to our disadvantage, since ideas that are apperceived slowly become thoroughly assimilated and exert a strong influence upon life.

Apperception is a fundamental educational doctrine and is generally accepted by modern educators. It lies at the foundation of the following truths, which should be remembered in connection with all teaching.

(1) When ideas are presented, the memory of past similar ideas will exert a modifying influence, and the tendency is to interpret the new idea by the old ideas which first come into consciousness. Each one interprets new ideas in the light of his experience. The artist sees in a landscape material for a beautiful picture, while the farmer sees in the same landscape so much fertile soil suitable for cultivation.

(2) The teacher needs to know the child's previous history before she can tell how he will receive certain ideas, especially those affecting his moral and social life.

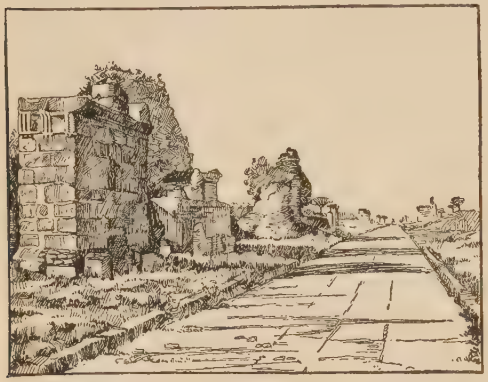
(3) The tendency of the mind to grow into fixed attitudes makes apperception of new truths more difficult as one becomes older.

(4) For the above reason the habits and views of life formed in childhood and youth are very important, because they influence one for all future time.

Other points bearing on this subject are treated in these volumes in the articles on association of ideas, interest, perception and psychology.

AP'PIAN WAY, called the Queen of Roads, the oldest and most renowned Roman road, was constructed during the censorship of Appius Claudius Caecus, 313 B. C. It was built with large square stones on a raised platform and led direct from the gates of Rome to Capua, in Campania. It was afterward extended through Samnium and Apulia

to Brundusium, the modern Brindisi. In 1850–1853, in the reign of Pius IX, it was excavated as far as the eleventh milestone from Rome. Even at the present day the



APPIAN WAY AS IT APPEARS TO-DAY

road in some parts is in excellent condition. It commands a beautiful prospect, embracing the Campagna, the ruins of the aqueducts and the mountains, while on both sides of the road are numerous ancient tombs.

APPLE, a fruit that many authorities consider the most valuable of any cultivated by mankind. It is by far the most generally cultivated of any grown in the temperate regions, and it is also one of the most appreciated. The person who does not enjoy eating apples is a rarity. The tree which bears this popular fruit belongs to the rose family. It can be grown in Norway and other countries as far north as 65 degrees north. The blossoms are very susceptible to injury from frost, but they appear much later than peach or apricot blossoms and so avoid the late frost which would be fatal to fruit bearing. Apple trees reach a moderate height and have spreading branches. The leaves are nearly oval, and the pinkish-white flowers are produced from very short shoots or spurs, which are usually of two years' growth.

North America is the leading apple-growing region of the world. Apples are raised for commercial purposes from Nova Scotia to Virginia and from New England to California and Washington. In recent years there has been a remarkable development in the apple industry of Idaho, Montana, and other Western states. The apples of this section are noted for their fine color and great size. It is true in general that the apples of the cold northern climates are smaller and harder than those of the hot summer climates of Canada and the United States. By placing winter apples in cold storage or even in cool cellars, the fruit can be kept in good condition through the winter months and until the earliest varieties which are raised in the warmer regions are on the market, so that it is possible to have apples the entire year.

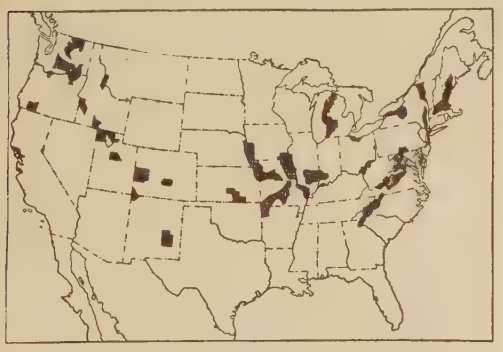
New varieties are obtained by planting the seed, but a desirable variety is seldom secured in this way, because the seeds do not reproduce the fruit from which they were taken; therefore orchard trees are prepared by grafting (see GRAFTING). In setting trees, the ground should be carefully prepared. The best results are secured by setting the trees in rows about thirty feet apart each way. Good cultivation is an important part of orchard management. Two crops can seldom be profitably grown on the same soil at the same time; the orchard should not be used as pasture or as regular farm land. Another essential of good management is pruning. This must be modified to suit the variety, the locality, and the purpose for which the tree is grown. In general, a low head, and wide-spreading branches evenly ranged about the trunk at different heights are desirable.

All of the numerous varieties have been derived from two species, the wild crab and the common apple. The fruit is a rather hard, juicy pulp that is formed around a core, which consists of five cells bearing two seeds each. The pulp is white or slightly pinkish. Most apples are nearly round, though some are elongated. In color there are nearly as many shades as there are varieties, though these shades are limited to red, green and yellow. Several thousand varieties of cultivated apples are known and about 1,000 are grown in the United States, though of this number not more than 100 are profitable, and not over twenty varieties are successful in any one locality. The numerous varieties are adapted to the soil and climate of widely different sections, and if removed from their native locality will seldom succeed. For instance, those most profitable in Canada

and the northern part of the United States, as New England, New York and Michigan, will not thrive as far south as the Ohio River, while the varieties accustomed to the warmer climate of southern Illinois and Missouri fail when removed to Michigan or New England. In general, the warmer apple-growing regions succeed best with the early fruit, while the colder regions, such as New England, Michigan and Northern New York, produce the best late fruit, or those varieties known as winter apples.

Apples are used in many ways. The choicest fruit is eaten raw, or it may be cooked by a dozen methods. Inferior grades are canned, evaporated or made into cider, which in turn is made into vinegar (see CIDER; VINEGAR).

Production in North America. *United States.* In 1917 there were produced in the United States 58,203,000 barrels of apples, but this figure is nearly 10,000,000 lower than that for 1916. New York, which produces about one-fifth of the total crop, is the leading apple state under average conditions, but nearly half the states produce over 1,000,000



APPLE DISTRICTS OF THE UNITED STATES

barrels annually. Pennsylvania, the Virginias, Michigan, Washington and Missouri are also important centers of apple growing. This branch of horticulture is developing rapidly in the West, where many of the orchards are young, and there is a distinct possibility that some day the Western states will overtake the Eastern in output. The western apples are large and beautifully colored, especially fine specimens being produced in the irrigated sections.

Canada. In 1871 the apple crop in Canada amounted to 6,000,000 bushels; it is now over 20,000,000, about eight per cent of the

Outline on the Apple

I. DESCRIPTION
- (1) Tree
  - (a) Shape
  - (b) Branches
  - (c) Leaves
  - (d) Blossom
- (2) Fruit
  - (a) With core and seeds
    - (1) Shape
    - (2) Color and texture of skin
    - (3) Pulp
    - (4) Core and seeds
  - (b) Seedless
    - (1) Color
    - (2) Flavor
    - (3) Size

II. WHERE GROWN
- (1) North America
- (2) Europe
- (3) South Africa
- (4) India and China
- (5) Australia

III. USES
- (1) Food
- (2) Feed for animals
- (3) Cider and vinegar

Questions on the Apple

To what family does the apple tree belong?

Of what continent is it a native?

What continent now leads in its production?

From what two species have all varieties been derived?

How many cultivated varieties of apples are known?

How many cultivated varieties are grown in the United States?

How many of these are profitable?

Do the seeds produce the fruit from which they are taken?

How are orchard trees prepared?

What is grafting?

What states produce the largest quantity of fruit?

Who has succeeded in growing the seedless and coreless variety of apples?

What is peculiar about the skin of these apples?

Why is the blossomless tree an important feature of this variety?

total being exported. Though the British Columbia crop is rapidly increasing, its annual value is by no means equal to that of Ontario. The Fraser Valley, the Columbia-Kootenay district and the Okanagan Valley are especially famous for fine apples. In Alberta apples are raised in considerable quantities in the district south of Edmonton. Apple raising in Manitoba is not yet a distinct industry, though many varieties of crab apple are cultivated. Ontario has about 11,500,000 apple trees, which yield a crop worth over $16,000,000; the province produces from 30,000,000 to 35,000,000 bushels each year, over half the apple crop of the Dominion. A considerable part of Ontario's crop is sent to the western provinces. These western shipments, which include some of the best fruit, total nearly 1,000,000 bushels a year. For many years Quebec and Nova Scotia each produced about ten per cent of the total for Canada, but since the great development of fruit raising in British Columbia their relative importance is slightly less. In 1916 Nova Scotia produced 600,000 barrels.

The bulk of the Ontario crop is sold within the province; at the same time the province in normal years exports more apples to Great Britain than any other state or province in North America. The greater part of the Canadian output finds a ready market at home; but a constantly growing fraction is exported, mainly to Liverpool, London and Glasgow. It seems that the Mediterranean countries may also be counted as future markets for Canadian apples. The growing use of apples at home, and the expanding markets abroad both for fresh and dried apples, indicate that the future will make the apple crop even more valuable than it is to-day.

Seedless Apples are one of the latest achievements in the cultivation of this common fruit. After several years of experimenting, Mr. John F. Spencer of Grand Junction, Col., and Luther Burbank of California succeeded in growing several trees that bore seedless and coreless apples. The fruit from these trees has a beautiful dark red color. It is of goodly size and has a pleasing flavor. An important feature of this seedless variety is the blossomless tree. There is a stamen and a very small quantity of pollen, but the rest of the flower is missing. This absence of the blossom leaves no place for the codling moth to lay its eggs, so that wormless apples are practically assured. The lack of the flower also removes the danger from late frosts. Many trees were at once grafted from the original few.

APPLE OF DISCORD, according to the story in Greek mythology, the golden apple thrown into an assembly of the gods by the goddess of discord. It bore the inscription "For the fairest," and Juno, Venus and Minerva all claimed it at once. Paris, chosen as judge, gave the apple to Venus, and the decision so inflamed the jealousy and hatred of Juno toward all of the Trojan race, that she did not cease her plots against it until Troy was destroyed. This incident is further described in the article MYTHOLOGY, subhead *The Trojan War.*

APPLETON, *ap'l ton,* WIS., founded about 1840, is the county seat of Outagamie County, 100 miles northwest of Milwaukee, on the Fox River and on the Chicago & Northwestern and the Chicago, Milwaukee & Saint Paul railroads. The city lies on a plateau seventy feet above the river and near the Grand Chute falls, which furnish water power for manufactures. The principal products include paper, farm implements, furniture, flour and woolen and knit goods. It is the seat of Lawrence College. The city was incorporated in 1857, and it adopted the commission form of government in 1910. Population, 1910, 16,773; in 1917, 18,005 (Federal estimate).

APPOMATTOX, *ap o mat'ox,* **COURT HOUSE**, a village in Virginia, famous as the scene of Lee's surrender to Grant. The village is situated twenty-five miles east of Lynchburg. The surrender, which virtually ended the Civil War, occurred on April 9, 1865. The articles of capitulation were signed in the McLean house, a large residence near the village. Population, about 500. See CIVIL WAR IN THE UNITED STATES.

A'PRICOT, a fruit of the plum genus, closely resembling the peach in appearance. It was first grown in Armenia and other parts of Asia, and also in Africa. The apricot is a low tree of rather crooked growth, with somewhat heart-shaped leaves. The fruit is sweet, more or less juicy, of a yellowish color, about two-thirds the size of the peach and resembling it in delicacy of flavor. It is one of the most highly esteemed fruits of the temperate climates. Apricots are raised in great quantities in Southern Eu-

rope and in California; in the latter state the annual crop is over 4,000,000 bushels. Part of the crop is canned.

APRIL, the fourth month of the year, and the one which is especially associated with the coming of spring. In this month the trees put on green leaves, early wild flowers begin to blossom, and the birds return in large numbers to their northern haunts. "April showers bring May flowers" is an expression often heard, suggesting that this month has its days of rain as well as sunshine. In fact, April is known as the month of changeable weather, and there are not only alternating wet and sunny days, but alternating hours of sunshine and rain. In the earliest Roman reckoning *Aprilis* was the second month, and it originally had twenty-nine days. When Caesar reformed the calendar this month received an additional day and since that time has had thirty days. Its special flower is the daisy, and its birthstone the diamond.

April has played a very peculiar part in American history, for every war in which the United States has engaged began in April, except the War of 1812. The list of April wars embraces the Revolution, the Mexican War, the Civil War, the Spanish-American War and the World War. The episode which nearly involved the country in a second war with Mexico also occurred in April (1914).

Special Days for Observance. *April Fools' Day,* or *All Fools' Day,* is a popular designation of the first of the month. On this day one is privileged to play harmless jokes on one's friends, or "make fools" of them. The custom seems to date back to the Middle Ages.

Arbor Day, set apart for the planting of trees, falls in April in a number of states. See Arbor Day.

Easter, (which see) also comes, usually in April.

Anniversaries for Celebration. The following birthdays of notable people fall in April:

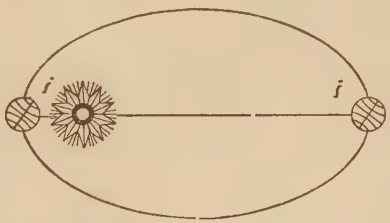
Hans Christian Andersen, April 2, 1805.
Washington Irving, April 3, 1783.
William Wordsworth, April 7, 1770.
Henry Clay, April 12, 1777.
Thomas Jefferson, April 13, 1743.
Friedrich Froebel, April 21, 1782.
William Shakespeare, April 23 (?), 1564.
Stephen A. Douglas, April 23, 1813.
Oliver Cromwell, April 25, 1599.
Alice Cary, April 26, 1820.
U. S. Grant, April 27, 1822.
James Monroe, April 28, 1758.
Duke of Wellington, April 29, 1769.

The following important events occurred in April:

Work begun on the first American railroad, April 1, 1826.
The first United States mint established in Philadelphia, April 2, 1792.
United States flag of present form adopted by Congress, April 4, 1818.
British Museum instituted, April 5, 1753.
Washington elected President, April 6, 1789.
War between the United States and Germany officially recognized by Congress, April 6, 1917.
Revival of Olympic games in Greece, April 6, 1896.
Union Jack adopted as the national flag of England, April 12, 1606.
Assassination of Lincoln, April 14, 1865.
Ride of Paul Revere, April 18, 1775.
Earthquake and fire in San Francisco, April 18, 1906.
Battle of Lexington, April 19, 1775.
Beginning of Spanish-American War, April 21, 1898.
Panama Canal transfer to United States signed, April 22, 1904.
Opening of Japanese ports to trade, April 25, 1867.
Inauguration of Washington, April 30, 1789.
Louisiana Purchase made, April 30, 1803.

APSE, in architecture, the term applied to the projecting semicircular portion of a building, roofed over separately by an arched vault or semidome. Most commonly it appears at the eastern end of the choir or chancel of a church. As the apse was considered the most holy part of the early church, rich decorations were lavished upon it. The exterior was sometimes square or octagonal, but even then the interior was semicircular. In later churches the central apse was flanked by smaller ones, called *apsidoles,* which terminated the aisles.

APSIDES, *ap'si deez* (singular, *apsis*), in astronomy the two points of the orbit of a heavenly body, situated at the extremities of the major axis of the ellipse formed by the



orbit. One of the points is that at which the body is at its greatest, the other that at which it is at its least, distance from the body

about which it revolves. In the accompanying diagram, *i i* show the apsides. The earth and the other planets, as they revolve about the sun and reach these two points respectively, are said to be in *aphelion* and *perihelion;* and the moon in revolving about the earth is in *apogee* and *perigee.* The line connecting the apsides, which is really the major axis of the orbit, is called the line of the apsides, and this has a slow, angular motion in the plane of the planet's orbit. In all the planets excepting Venus, this motion is forward. See PRECESSION OF THE EQUINOXES.

AP'TERYX, a small bird belonging to the same family as the ostrich and living in New Zealand. It is a shy, nocturnal bird, feeding

APTERYX

on worms, insects and seeds, and is totally wingless and tailless. These birds are becoming extinct.

A'QUA FOR'TIS, meaning *strong water,* is a common name for nitric acid (which see).

AQUAMARINE, *a qua ma reen'*, a name given to some of the finest varieties of beryl, of a sea green or blue color. The name is also applied to varieties of topaz. The aquamarine occurs in North Carolina, Colorado, Siberia and Brazil. It is one of the birthstones for March.

AQUA RE'GIA. See NITRIC ACID.

AQUA'RIUM, a vessel constructed wholly or partly of glass, and containing salt or fresh water, in which are kept living specimens of marine or fresh-water animals, along with aquatic plants. In principle the aquarium depends on the relations of animal and vegetable life; animals consume oxygen and exhale carbonic acid, plants reversing the process by absorbing carbonic acid and giving out oxygen. The aquarium must consequently be stocked both with plants and animals, and for the welfare of both, something like a proper proportion should exist between them.

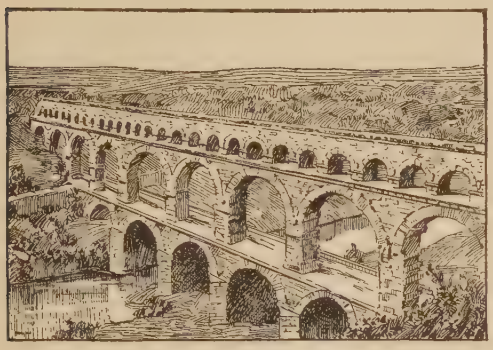
The simplest form of aquarium is that of a glass vase; but aquariums on a larger scale consist of a tank or a number of tanks with plate-glass sides and stone floors, and contain sand and gravel, rocks and seaweed. By improved arrangements, light is admitted from above, passing through the water in the tanks and illuminating their contents. Aquariums on a large scale have been constructed in connection with public parks or gardens, and the name is also given to places of public entertainment in which large aquariums are exhibited. The largest aquarium in the world is at Castle Garden, N. Y. It contains 150 tanks for smaller fish, and a number of gigantic tanks for sharks and other large and dangerous fish.

AQUA'RIUS, meaning the *water bearer,* is the name of a constellation, and the eleventh sign of the zodiac. The symbol was ♒ (running water), and the name Aquarius was given because of the rains that fell so plentifully in Italy during January and February, when the sun moves in the sign.

AQUATIC, *a kwat'ik,* **PLANTS**, a general name applied to any plants which live either wholly or partly in water. Some of these plants are rooted in the ground and grow through the water, raising their leaves and blossoms above the surface. The leaves of some of these are very large, and the flowers beautiful. Other plants remain almost wholly submerged, the leaves in that case becoming small and more or less thread-like, while the flowers may be either submerged or floating on the surface. Many of the seaweeds and some plants in the inland waters are buoyed up by bladders that form on the leaves, and in a few species the plants break loose entirely from the earth and float about in the waters, from which they obtain nourishment by means of their roots. There are representatives of aquatic plants in many different families, of which the common water lily, the pond weed, the cat-tail and the water hyacinth are notable examples.

AQ'UEDUCT, an artificial channel or conduit for the conveyance of water from one place to another. The name is more particularly applied to structures for conveying water from distant sources for the supply of large cities. Aqueducts were extensively used by the Romans, and many of them still

remain in different places on the continent of Europe, some being still in use. The Pont du Gard in the south of France, fourteen miles from Nîmes, is still nearly perfect, and is a grand monument of the Roman occupation of that country. The ancient aqueducts were constructed of stone or brick, sometimes tunneled through hills and carried over valleys and rivers on arches. The Pont du Gard is built of great blocks of stone; its height is 160 feet, and the length of the highest arcade is 882 feet. The aqueduct at Segovia, originally built by the Romans, has in some



ROMAN AQUEDUCT, NEAR NIMES, FRANCE

parts two tiers of arcades 100 feet high, is 2,921 feet in length, and is one of the most admired works of antiquity. One of the most remarkable aqueducts of modern times is that constructed by Louis XIV for conveying the waters of the Eure to Versailles. The aqueduct of Marseilles, forty miles in length, is also a remarkable structure.

The extensive application of metal pipes has rendered the construction of aqueducts of the old type unnecessary; but what may be called aqueduct bridges are still frequently constructed in connection with waterworks for the supply of towns. Where canals exist, canal aqueducts are common, since the water in a canal must be kept on a level. In the United States there are several notable aqueducts. The old and new Croton aqueducts, which help supply New York City with water, are described under the heading CROTON AQUEDUCT. A more ambitious project is the great Catskill Aqueduct, begun in 1906 and formally dedicated in the fall of 1917. The aqueduct proper is ninety-two miles long, but there are thirty-four additional miles of branch lines in New York City. The system has now a capacity of 250,000,000 gallons per day, but this will eventually be increased to 500,000,000 gallons.

In 1917 construction was begun on the last of the chain of reservoirs of the aqueduct system supplying Los Angeles, Cal. This is the longest aqueduct in the world, its total length being 235 miles. The flow begins at an elevation of 3,800 feet above sea level, and the water is conducted to the city by gravity. As the entire flow of the Owens River is diverted, there is an abundance of water for the domestic needs of Los Angeles, and a surplus for irrigation and power purposes. The system was begun in 1907 and was ready for operation in 1914.

AQUINAS, *a kwī'nahs,* SAINT THOMAS (1227–1274), a celebrated divine, who taught at Cologne, Rome, Bologna and Pisa. His pupils called him "The Angelic Doctor." The most important of his numerous works, which were all written in Latin, is the *Summa Theologiae,* the standard authority on the doctrines of the Roman Church. Aquinas was canonized by John XXII in 1323.

ARA'BIA, a great peninsula in the southwestern part of Asia, having an area of 1,000,000 square miles, and a population of about 5,000,000. In its general features Arabia resembles the Sahara, for it consists of a central table-land surrounded by a series of deserts with scattered oases. Around this region there is a line of mountains parallel to and approaching the coasts. A narrow rim of low ground lies between the mountains and the sea. Arabia is renowned in history as the cradle of one of the world's great religions, Mohammedanism, and as the home of a people who in times past contributed much to the advancement of chemistry, astronomy, mathematics and geography. Its inhabitants to-day are united in their religion, for nearly all are Mohammedans, but politically there is no central government. At the outbreak of the World War Turkey controlled the west coast and part of the east coast; Oman, in the extreme southeast, was an independent country under British influence; Aden, a city and district in the

southwest corner, was a British possession, and the great central region was under the sway of native rulers, bearing the title of shiek, emir or imam.

The Kingdom of Hedjaz. Hedjaz, a narrow strip of country along the eastern shore of the Red Sea, came under Turkish control in the sixteenth century, and remained a dependency of the Ottoman Empire until November, 1916. Because of Turkish outrages against the Arabs during the first two years of the World War, and especially because of the sacrilegious bombardment of the holy city of Mecca, the people of Hedjaz revolted and set up an independent kingdom under the leadership of El Hussein ibn Ali, the Grand Sherif of Mecca and lineal descendant of the Prophet. The new kingdom was recognized by the allied powers, was given financial aid by Great Britain, and gave valuable military assistance to the allies in their war against Turkey. The exact boundaries of the kingdom were to be determined by the League of Nations after its organization.

In the new kingdom are the two holy cities of the Mohammedans, Mecca and Medina.

Climate and Production. The climate of Arabia is in general marked by extreme heat and dryness. Aridity and barrenness characterize both high and low grounds, and the date-palm is often the only sign of vegetable life. There are districts which in the course of the year are scarcely refreshed by a single shower of rain. The area of forest land is small. Instead of pastures there are steppe-like tracts, covered for a short season with aromatic herbs, which serve as food for the cattle. The date-palm furnishes the staple article of food; the cereals are wheat, barley, maize and millet; various sorts of fruit flourish, and coffee and many aromatic plants and substances such as gum-arabic, benzoin, mastic, balsam, aloes, myrrh and frankincense, are produced. There are also cultivated in different parts of the peninsula, according to the soil and climate, beans, rice, lentils, tobacco, melons, saffron, poppies and olives. Sheep, goats, oxen, the horse, the camel, the ass and the mule are the chief domestic animals. Among the wild animals are gazelles, lions, panthers, hyenas and jackals, while in the oases ostriches are numerous. Among mineral products are saltpeter, mineral pitch, petroleum, salt, sulphur and several precious stones, as the carnelian, the agate and the onyx.

The People. The inhabitants of Arabia are known as Arabs. They are described under that title.

History. Obscurity shrouds the early history of the people of Arabia. Before the time of Mohammed the Arabs were idolaters, but after the destruction of Jerusalem in A. D. 70 great numbers of Jews sought refuge in the peninsula and made known to the people there the doctrine of the one God. Christianity was planted there also, and when Mohammed began his work the ground had been somewhat prepared for him. Through the genius of the Prophet the new religion gained a sure hold, and eventually the Arabs united in order to extend their faith. Under the caliphs, Mohammed's successors, they conquered Persia, Syria, Egypt and North Africa, and even set up a kingdom in Spain.

The fall of the caliphate of Bagdad in 1258 marked the beginning of a decline in power, and in the fifteenth century, when the Mohammedans were expelled from Spain, the foreign rule of the Arabs came to an end. In the sixteenth century Hedjaz and Yemen (in the southwest, between Hedjaz and Aden) came under Turkish rule, and the sultan also became nominal ruler of the tribes inhabiting the rest of Arabia. Yemen gained its independence in the seventeenth century, maintaining it until 1871; the revolt of Hedjaz has been described. The boundaries and status of the various sections of Arabia were to be decided by the Peace Conference which began sessions in Paris in 1919.

Related Articles. Consult the following titles for additional information:

Aden	Mecca	Oman
Kaaba	Medina	World War

ARA'BIAN NIGHTS, known also as "The Thousand and One Nights," a celebrated collection of Eastern tales, supposed to have been derived by the Arabians from India, through the medium of Persia. They were first introduced into Europe in the beginning of the eighteenth century by means of the French translation of Antoine Galland. The story which connects the tales of *The Thousand and One Nights* is as follows: The Sultan Shahriyar made a law that every one of his future wives should be put to death the morning after marriage. At length one of them, Shahrazad, the generous daughter of the grand vizier, succeeded by a strategem in abolishing the cruel custom. By breaking off each night in the middle of an interesting

tale, she led the sultan to delay her execution day after day, until he had fallen in love with her and decided to let her live. The tales have been translated into almost all languages and have attained a wider circulation than any other book except the Bible.

ARABIAN SEA, the part of the Indian Ocean between Arabia, India and Beloochistan. The Red Sea and the shallow Persian Gulf are properly arms of the Arabian Sea. Its former commercial importance has been somewhat restored since the opening of the Suez Canal in 1869.

AR'ABIC NU'MERALS. See ARITHMETIC.

ARABI PASHA, *a rah'be pa shah'* (1841–1911), an Egyptian soldier and revolutionary leader. In September, 1881, he headed a military revolt, and was for a time virtually dictator of Egypt. England interfered, and after a short campaign, Arabi surrendered and was banished to Ceylon. In 1901 he was allowed to return to Egypt.

AR'ABS, the race of people inhabiting Arabia. They are slender, but are powerfully built, are brownish in color and have clear-cut features. The average Arab is active, intelligent and particularly courteous to white people, but he will at once turn and rob them if opportunity offers. His code of morals endorses this. Over half of the people are nomadic, that is, they are in wandering tribes, driving their flocks and herds wherever sustenance can be found. They are not a commercial people; Arabia's commerce is largely in the hands of Europeans.

The first religion of the Arabs, the worship of the stars, was supplanted by the doctrines of Mohammedanism, which succeeded rapidly in establishing itself throughout Arabia. Besides the two principal sects of Islam, the Sunnites and the Shiites, there also exists, in considerable numbers, a third Mohammedan sect, the Wahabis, which arose in the latter half of the eighteenth century and for a time possessed great political importance in the peninsula.

The Arabic language is one of the two living dialects of Semitic speech, and it is distinguished among Semitic tongues for its richness, softness and high degree of development. By the spread of Islam it became the sole written language and the prevailing speech in all southwestern Asia and eastern and northern Africa, and for a time in southern Spain, in Malta and in Sicily; and it is still used as a learned and sacred language wherever Islam is spread.

Mohammed gave a new direction to Arab literature. The rules of faith and life which he laid down were collected by Abu-bekr, the first caliph after his death, and published by Othman, the third caliph as the *Koran*—the Mohammedan Bible. Most of the geography in the Middle Ages is the work of the Arabians, and their historians since the eighth century have been very numerous. In medicine they excelled all other nations in the Middle Ages, and they are commonly regarded as the earliest experimenters in chemistry. Their mathematics and astronomy were based on the works of Greek writers, but the former they enriched, simplified and extended. It was by them that algebra was introduced to the western peoples. Astronomy they especially cultivated, and observatories were erected at Bagdad and Cordova. Tales and romances in prose and verse were written. Tales of fairies, genii, enchanters and sorcerers in particular, passed from the Arabians to the western nations, as in *The Arabian Nights*. See KORAN.

ARACHNE, *a rak'ne*, in classic mythology a girl who was changed into a spider by Minerva because she presumed to compete with the goddess in weaving. Her story is given in full in the article MYTHOLOGY.

ARACHNIDA, *a rak'ni dah*, a class of air-breathing animals which includes the spiders, scorpions, mites and ticks. A few live on plants, but most of them are carnivorous. As a whole, they are beneficial to agriculture, as they prey on insects; but some parasitic forms are destructive to both plants and animals. Many have glands which secrete poisons, and the spiders have attached to their abdomens spinnerets, from which are secreted the threads of which webs are formed. Arachnida are a subdivision of the subkingdom Arthropoda (which see).

ARAFAT, *ah rah faht'*, or **JEBEL ERRAHM** (mountain of mercy), a granite hill in Arabia, fifteen miles southeast of Mecca. It is about 200 feet high, and has stone steps reaching to the summit. It is one of the principal objects of pilgrimage among Mohammedans, who say that it was the place where Adam first received his wife, Eve, after they had been expelled from Paradise and separated from each other 120 years. A sermon delivered on the mount constitutes the main ceremony of the Hadj, or pilgrim-

age to Mecca, and entitles the hearer to the name and privileges of a Hadji, or pilgrim.

ARAGON, *ah ra gon'*, a former province or kingdom in the northeastern part of Spain, now divided into the three provinces of Teruel, Huesca and Saragossa. It was governed by its own monarchs until the union with Castile on the marriage of Ferdinand and Isabella in 1469. The real union of the countries, however, did not come until about ten years later. See FERDINAND V.

ARAGUAY, *ah rah gwi'*, a Brazilian river, rising in the Serra Cayapo. It flows north and joins the Tocantins at Sao Joao. About the middle of its course it divides into two arms, enclosing the island of Bananal. The length of the Araguay is 1,300 miles, of which 750 are navigable. The lower course has numerous rapids.

AR'AL, a salt-water lake in Asia, about 150 miles west of the Caspian Sea. Of the numerous rivers which formerly emptied into it, two alone now reach it—the Amu-Darya or Oxus, and the Syr-Darya or Jaxartes. The lake contains an abundance of sturgeon and other fish. It has a large number of islands. Navigation on it is difficult because of the shallowness of the waters and the fierce and sudden storms from the northeast.

ARAMA'IC, a branch of the Semitic language, nearly allied to the Hebrew and Phoenician, anciently spoken in Syria and Palestine, and eastward to the Euphrates and Tigris. It was the official language of this region under the Persian domination. In Palestine it supplanted Hebrew, and it was the tongue of the Jews in the time of Christ. Parts of *Daniel* and *Ezra* are written in Aramaic, or, as this form of it is often named, Chaldee. An important Aramaic dialect is the Syriac, in which there is an extensive Christian literature. See CHALDEE LANGUAGE; HEBREW LANGUAGE AND LITERATURE.

ARAPAHO, *ar ap'a ho*, a tribe of American Indians once located near the headwaters of the Arkansas and Platte rivers. The survivors live in Oklahoma, where they are peaceably engaged in farming. They number about 1,800.

AR'ARAT, MOUNT, a celebrated mountain of Armenia, in Western Asia, on which, tradition says, Noah's ark rested. It rises in two volcanic cones, the higher one of which is 17,260 feet above sea level. Frightful earthquakes visit the region. In 1840, masses from the mountain were thrown into the plain, destroying the gardens, convent and chapel of the village of Arguri, and burying many people.

ARAUCANIAN, *ah row kah'ne an*, a native race living in the southern part of Chile. They are warlike and more civilized than many of the native races of South America, and maintained almost unceasing war with the Spaniards from 1537 to 1773, when their independence was recognized by Spain, though their territory was much curtailed. In 1882 they submitted to Chile. The Chilean province of Arauco receives its name from them.

ARAUCA'RIA, a genus of cone-bearing trees belonging to the southern hemisphere. They are lofty evergreen trees, with large, stiff, flattened leaves, generally overlapping along the branches, like the shingles on a roof. The spreading branches are in whorls around the trunk and bear large cones, each scale covering a single large seed, which is edible when roasted. The Moreton Bay pine of New South Wales supplies a valuable timber used in house and boat building, in furniture making and in other carpenter work. Another species, the Norfolk Island pine, abounds in several of the South Sea Islands, where it attains a height of 220 feet, with a circumference of thirty feet. It is described as one of the most beautiful of trees. Its foliage is light and graceful, quite unlike that of the Chile pine, which is stiff and formal in appearance. Its timber is of some value, being white, tough and close-grained.

AR'BALEST. See CROSSBOW.

ARBE'LA (now Erbil), a place in the Turkish province of Bagdad which gave its name to the decisive battle fought by Alexander the Great against Darius, at Gaugamela, about twenty miles distant from it, 331 B. C. Population, about 4,000.

ARBITRA'TION, the hearing and determination of a dispute between two persons or two groups of persons by one or more men chosen by the parties to decide the issue. Frequently one arbitrator is appointed by each side and these two select the third. Those who thus sit in judgment are called *judges*, and their decision is called the *award*. Both parties to the controversy are pledged to accept the decision of the judges. The majority of instances in which arbitration is resorted to are connected with the cause of labor.

In Pennsylvania arbitration is compulsory, if one of the parties desires it; elsewhere in the United States it is voluntary. In New Zealand it has been compulsory since 1894; in Norway, since 1916.

The principle of arbitration has been recognized for centuries as a just and honorable means of settling international claims. The first conspicuous instance in modern times was when Pope Alexander VI drew the line of demarcation (see DEMARCATION, LINE OF). The Alabama Claims and the Bering Sea controversy (both of which see), are other conspicuous examples.

The greatest step ever taken in the direction of international peace by arbitration was the establishment of the permanent international court of arbitration at the Hague (see PEACE CONFERENCE, INTERNATIONAL). The belief in arbitration as a means of adjusting all international claims has constantly been gaining adherents, and not many years ago it was believed that another great war could not possibly occur; yet the World War, the worst in all history, involved over twenty nations in 1914.

AR'BOR DAY, a day designated by legislative enactment in many states for the voluntary planting of trees by the people. It was inaugurated in 1874 by the Nebraska state board of agriculture, at the suggestion of J. Morton, afterwards Secretary of Agriculture in President Cleveland's second administration. Nearly every one of the states has since established an annual Arbor Day and observes it as a legal holiday, the school children being generally prepared for a special observance of the occasion. Bird Day is also now associated with Arbor Day, its purpose being to instruct children in the care and protection of birds. Several states publish manuals of exercises and instructions for the day's observance in the schools. Arbor Day is observed late in April or early in May in the Northern states, and between December and March in the South. The observance of this tree-planting day has also spread to Canada.

AR'BOR VI'TAE, meaning *tree of life,* is the name of several cone-bearing trees, allied to the cypress, with flattened branchlets, and small or scale-like leaves, overlapping like the shingles on a roof. The common arbor vitae is a native of North America, where it grows to the height of forty or fifty feet. The young twigs have an agreeable balsamic smell. The Chinese arbor vitae, common in Britain, yields a resin which was formerly thought to have medicinal virtues.

ARBUTUS, *ahr'bu tus,* a genus of plants belonging to the heath family and comprising a number of small trees and shrubs, natives chiefly of Europe and North America. The *trailing Arbutus,* or *Mayflower,* of North America, a choice plant with fragrant pink or white blossoms, is the best-known species of Eastern Canada and the United States. Other species include the strawberry tree and the madroña of California.

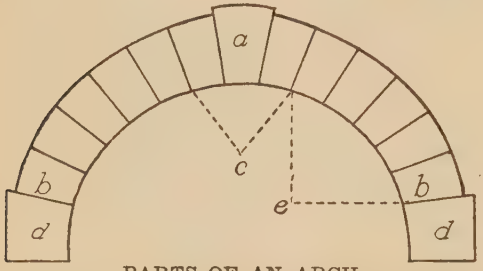
TRAILING ARBUTUS
Blossoms and leaves.

ARCADE, *ahr kade',* a series of arches supported by columns either attached to a wall or having an open space behind them. The word is used in contradistinction to *colonnade,* which is a series of columns supporting a straight entablature instead of arches. The arcade is found both in the inside and outside decoration of medieval buildings. In street architecture, it is a covered way or passage, either open at the side with a row of columns or entirely covered over and lined with shops and stalls. The finest arcades of this description are to be found in Paris, though Bologna, Padua and Berne also have fine examples.

ARCA'DIA, the central and most mountainous portion of the Peloponnesus (Morea), the inhabitants of which in ancient times were celebrated for simplicity of character and manners. Their occupation was almost entirely pastoral, and thus the name *Arcadia* has come to be regarded as typical of rural simplicity and happiness. See GREECE; SPARTA.

ARCH, in architecture, a portion of mason work in the form of a curved structure used to span an opening, and in buildings to support heavy weights. It is composed of wedge-shaped pieces, the middle stone be-

ing called the *keystone* and the lowest stone on either side the *springer*. The highest part is the *crown;* the sides, *haunches;* the inner curve, the *intrados;* the exterior or upper curve, the *extrados;* the base which supports the lowest stone on each side, the *impost*. The simplest and oldest means of supporting a structure over a doorway was the use



PARTS OF AN ARCH
a, keystone; b, arch stones, ring stones, or voussiers; c, crown; d, springer, or skewbac; e, haunches, also span.

of a single stone, or *lintel,* of sufficient length. This expedient for the most part met the needs of the early Egyptians, Assyrians, Etruscans and Greeks, who were acquainted with the arch but used it only occasionally. The Romans employed the arch extensively and developed it to its highest type of usefulness, introducing it not only in their buildings but also in the drains, aqueducts and bridges. The curved arch continued in use everywhere till the Middle Ages, when the pointed or Gothic form was introduced. Out of this arch there developed a variety of forms.

The longest stone span in the United States, and one of the two longest in the world, is the Cabin John Bridge, near Washington, D. C., with a span 220 feet long, a rise of fifty-seven feet and a width of twenty feet (see BRIDGE). An arch 251 feet in span, the largest stone arch ever made, was built over the River Adda in Northern Italy in the latter part of the fourteenth century. Famous steel arches include the one which supports the carriage bridge below Niagara Falls, and the one of Hell Gate Bridge, New York.

Arches are used not only for constructive but also for decorative purposes. Sometimes a floral or light arch is built across a street on the occasion of some public event, and, again, single arches are erected for gateways or as memorials. The latter form, or *triumphal arch,* was originally a simple, decorated arch under which a victorious Roman general and army passed in triumph; but, at a later period, for the simplicity was substituted elaborate decoration. During the Middle Ages the triumphal arch fell into disuse, but since the Renaissance many memorial arches have been built, and to-day they are generally popular.

Related Articles. Consult the following titles for additional information:
Arch of Triumph
Constantine, Arch of
Titus, Arch of
Trajan, Arch of

ARCHAEOLOGY, *ahr ke ol'o jy,* the science which deals with the history of nations and peoples, as shown by the remains which belong to an earlier epoch of their existence. In a more extended sense the term embraces every branch of knowledge which bears on the origin, religion, laws, language, science, arts and literature of ancient peoples. It is to a great extent the same as *prehistoric annals,* as a large, if not the principal, part of its field of study extends over those periods in the history of the human race, in regard to which we possess almost no information derivable from written records. Archaeology divides the primeval period of the human race, more especially as exhibited by remains found in Europe, into the Stone, the Bronze and the Iron ages, according to the chief material employed for weapons and implements during the particular period.

Related Articles. Consult the following titles for additional information:
Age
Bronze Age
Iron Age
Stone Age

ARCHAEOPTERYX, *ahr ke op'te rix,* the name given to a fossil bird found in the stones of Bavaria. From these remains it was evident that the bird was about the size of a crow and possessed a long, cumbersome tail, supported by twenty vertebrae. It was evidently of little assistance in flying. Most strange of all, it had, in both mandibles of its rather blunt bill, a number of teeth, each set in a separate socket. This is the oldest known species of bird and is exceedingly interesting as showing the relationship between the reptiles and the birds.

ARCHANGEL, *ahr kahn'jel,* RUSSIA, a seaport situated at the mouth of the Dvina River, on the White Sea, and capital of the government of the same name. It is the largest incorporated town in the world situated so far north, being 740 miles northeast of Petrograd and less than 2° south of the Arctic Circle. During the World War

Archangel was of great importance to Russia as a shipping point and base of supplies for the north, but its value as a port is lessened by the rigorous climate, which keeps the harbor ice-bound six months in the year. After the Russian revolution and the rise to power of the Bolsheviki, grave apprehensions were felt by the allies as to the safety of war supplies stored at Archangel, and in September, 1918, American and other allied forces were sent to the port to maintain order. For months there was active fighting in the Archangel region between these troops and the Bolsheviki army, the outcome of which was not decisive, and in the spring of 1919 the American troops were called home.

Archangel was founded in 1584. It contains a number of fine buildings, including a handsome cathedral. In normal times the export trade in linseed, flax, tow, timber and other products amounts to about $4,500,000 annually, and the September fair is attended by merchants from all over Russia. Population, 1911, 37,987.

ARCHBISH'OP, the chief bishop of an ecclesiastical province, which is usually termed a *see*. The title originated sometime in the fourth century, and the office is recognized in the Anglican, Roman Catholic and Greek churches. The archbishop of Rome is the Pope, and the patriarch of Moscow holds a similar position in the Greek Church. England has two archbishops, one at Canterbury and the other at York. The Archbishop of Canterbury is styled primate of all England, and has supreme ecclesiastical authority over the Anglican Church of the United Kingdom. The Roman Catholic is the only Church maintaining the office of archbishop in the United States, which is divided into fourteen provinces or sees. See BISHOP.

ARCHEAN, *ahr ke'an*, **SYSTEM**, the oldest rock formations in the earth's crust. These rocks were deposited in the Archeozoic Era. The rocks of this system are chiefly of igneous origin (see IGNEOUS ROCKS), and they are represented by granites, gneisses and schists. Most of them have been subjected to many disturbances, which have so changed their original character that it is impossible to work out any order of succession of strata that will apply to all parts of the world. As a rule, the Archean rocks form the cores of the great mountain systems and are the original source from which the mountains rise. In North America they are found covering a large portion of the region between the Arctic Ocean and the Great Lakes, in the Adirondacks, along the Appalachians and in the Rocky Mountains. In Europe they are prominent in the Scandinavian Peninsula, France, Germany and Austria. They also occur in Eastern Asia and Central Africa. See ALGONKIAN SYSTEM; CAMBRIAN SYSTEM. See also, GEOLOGY.

ARCH'ER-FISH, a name given to a small, spiny fish about six inches long, inhabiting the seas around Java. It has the faculty of shooting drops of water to the

ARCHER-FISH

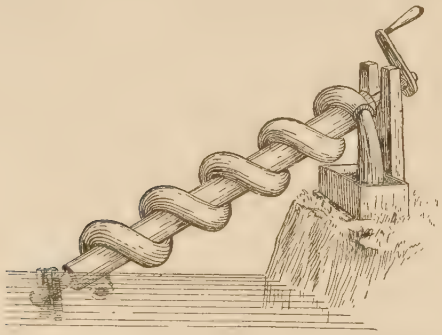
distance of three or four feet at insects, thereby causing them to fall into the water, where they are seized and devoured. The soft and even the spiny portion of the dorsal fins are so covered with scales as to be scarcely distinguishable from the rest of the body.

ARCH'ERY, the art of shooting with a bow and arrow. The use of these weapons in war and the chase dates from the earliest antiquity. Ishmael, we learn from *Genesis* XXI, "became an archer." The Egyptians, Assyrians, Persians and Parthians excelled in the use of the bow, and while the Greeks and Romans themselves made little use of it they employed foreign archers as mercenaries. The English victories of Crécy, Poitiers and Agincourt may be ascribed to the bowmen. Archery disappeared gradually as firearms came into use, and as an instrument of war or the chase the bow is now confined to the savage tribes of both hemispheres. But though the bow has been long abandoned among civilized nations as a mil-

itary weapon, it is still cherished as an instrument of healthful recreation. In recent years a number of archery clubs for shooting at bull's-eye targets have been formed in the United States and Canada, and interest in the sport is increased by the fact that it is an open-air sport for women as well as for men.

ARCHIBALD, Adams George, Sir (1814–1892), a Canadian statesman, born at Truro, Nova Scotia; educated at Pictou College. He entered public life in 1851, when he was elected to the House of Assembly of Nova Scotia. He became in turn solicitor-general for the province, attorney-general advocate-general in the vice-admiralty court of Halifax, and member of the Dominion Parliament. He was a member of the Quebec Conference and played an important part in the work preceding Confederation. He resigned from Parliament in 1870 to become the first lieutenant-governor of Manitoba, a position he filled for two years. In later years he was lieutenant-governor of Nova Scotia and from 1888 to 1891 again a member of the House of Commons.

ARCHIMEDEAN, *ahr ki mee'de'an*, **SCREW**, a device for raising water, consisting of a spiral blade attached to an axis and enclosed in a tightly fitting cylinder. The device is fixed to an incline and has the lower end immersed in the water. By turning the crank the water is raised and flows out of the upper end of the cylinder. A simpler pattern is made by winding a tube like a piece of lead pipe spirally round an axis. The Archimedean screw can be used

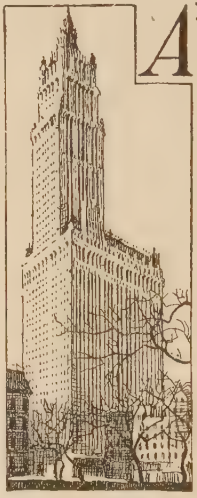


TUBULAR ARCHIMEDEAN SCREW

successfully to raise water from twelve to fifteen feet. It is sometimes employed among primitive peoples where it is desired to raise a large quantity of water with comparatively little power.

ARCHIMEDES, *ahr ki mee'deez* (287–212 B. C.), the greatest mathematician of antiquity, a native of Syracuse in Sicily. The most important among his extant works are three on plane geometry, three on solid geometry, three on mechanics and one on arithmetic. He discovered the principle of the lever and of specific gravity; constructed a machine for raising water, called the Archimedean screw, and invented burning mirrors and hurling engines that were effective in warfare. After the siege of Syracuse, where with his burning glasses Archimedes had fired the Roman fleet, a Roman soldier, rushing into the philosopher's study, found him calmly drawing geometrical figures. Not noticing the soldier's drawn sword, the old man cried, "Don't disturb my circles." Enraged, the soldier slew him on the spot.

ARCHIPELAGO, *ahr ki pel'a go.* See Island.



ARCHITECTURE, *ahr'ki tek ture*, in a general sense, the art of designing and constructing buildings.

Architecture a Fine Art. If buildings were meant to serve but one purpose, and that utility; if a house were only a shelter; if a capitol were only a place where government business might be transacted; then architecture would have no place among the fine arts. But the purpose of architecture is the production of beautiful and harmonious, as well as strong and convenient, buildings; and thus the good architect must be not only a practical man who understands the use of building materials and the mechanical problems of construction, but an artist with imagination and a knowledge of the beautiful.

The most primitive peoples paid no attention to the beauty of their buildings; a dwelling was a place into which to crawl at night or during bad weather; if it answered that one demand it did all that was required of it. But gradually as men had a little leisure for other things than the protection of themselves from enemies and the procuring of food, crude ideas of ornamen-

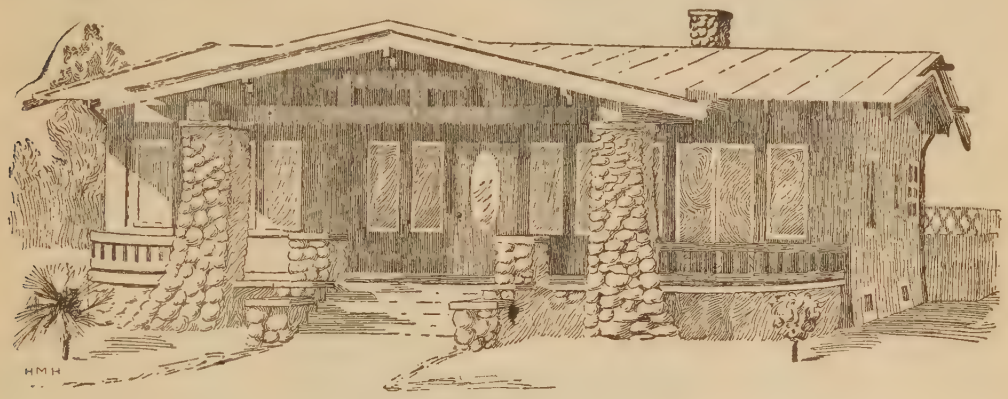
tation sprang up; and as man became more and more civilized he paid more and more attention to the erection of buildings which would please the eye. By the time we come to the dawn of authentic history we find a well-developed architecture. No one can read of the pyramids of Egypt and fail to be impressed with the ability and skill displayed in the raising, moving and adjusting of the huge blocks of marble and granite, weighing hundreds of tons, of which those structures are composed. Even today, with all the mechanical equipment which we have at our command, the building of such structures would be a tremendous task; and it seems incredible that the ancients, with their simple machinery, could have accomplished it.

Every age, and to a certain extent every country, has had its own particular architectural problems to solve and difficulties to meet. The overcoming of these difficulties has in a measure determined the style of architecture of each period and people; although of course the varying ideas as to beauty have had much to do with the subject.

One can enjoy looking at a beautiful, symmetrical building without knowing anything whatever about its architectural style or about the history of architecture in general, but the interest and enjoyment are greatly increased by some knowledge of the subject. In looking perhaps at a wonderful old-world cathedral or at a comparatively prosaic modern office-building, certain questions naturally arise. Why was this building made in this particular style? Would any other style have answered just as well? What were the difficulties the architect encountered? Was it a new style of architecture which he evolved for himself or did it grow naturally out of something which preceded? The ability to answer these and like questions will make the sight of buildings, new and old, much less commonplace than it is likely to be when we give no particular thought to the subject.

Home-Building. There can be no phase of the subject of architecture more interesting to the general student than that of home-building. This means the erection not of a many-roomed palace in which some wealthy family passes a few months of the year, but of a home in which a family of moderate means has its whole life. A man in the city is likely to live in a building which some one else has erected; he has had no part in choosing the type of building, the ornamentation, even the arrangement of the rooms. His family must have some place to live, and a certain house or apartment building appeals to him as, all things considered, more desirable than its neighbors. The majority of city people have little chance to display any individuality or originality in the exterior of their dwellings.

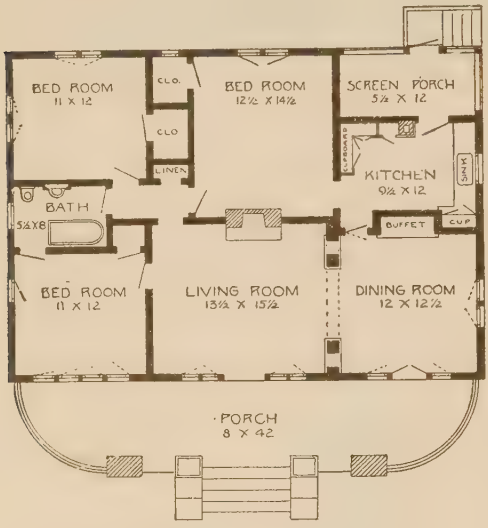
But in the country and in small towns, conditions are different. A man is much more likely to build his own home than he is to rent one. And it is in this connection that the subject of the proper style of architecture for a home assumes importance. Perhaps a man in a small town has what he realizes is a very limited amount with which to build a home. There is one easy thing



A BUNGALOW OF ARTISTIC DESIGN
Costs little, if any, more than the plainest structure along old-time lines.

to do. The neighbors on both sides and farther up the street have built houses which have cost no more than he plans to spend on his: he may make his like theirs. With this idea, he erects the conventional small-town house, with its stiff, straight lines, its pointed roof, its wing to one side or the other, and its small porch. Perhaps the new home is gray and has its front door on the left hand side, while its neighbor is green and has its front door in the center; but in all essential respects the house is like three-quarters of the houses in town. It has little individuality, little distinction; nothing has gone into it to make the owner feel that it is really *his* except his money.

The necessity of building a house for little money does not make such a state of things unalterable. Architects, even good architects, do not always confine themselves to designing elaborate homes that demand a great outlay of money. There has been, particularly within the last few years, much attention given to the planning of inexpensive



AN ATTRACTIVE GROUND PLAN
The interior of the house shown in the illustration on the preceding page.

but attractive homes, and other people besides those who paid for the original plans have had the benefit of them. For many of the magazines publish from month to month pictures and plans of houses, describing materials and giving prices. Of course in choosing a home from a pictured design, care is necessary, and many things must be taken into consideration. The size and shape of the lot, the direction in which the house is to face, the style of the neighboring buildings must all influence the choice.

The illustrations here given show an attractive bungalow which may be built for the reasonable sum of $1,600, with prices of material and labor at their highest point.

The "Sky-Scraper." American architects have not invented "styles," in the sense in which we speak of Greek or Roman architecture; but they have modified other styles. More especially of late this modification has taken the particular turn of making the style of architecture fit the type of building. There was a time when if a building was beautiful in itself there was little attention paid to the question as to whether or not it looked like that for which it was intended. A schoolhouse might look like a Greek temple; a residence might resemble a jail, or a church might look like an office-building. To-day, however, a building to be considered artistic must look like what it is.

But the most thoroughly American type of building which has ever been developed is the huge office-building which is known as the "sky-scraper." As land in the down-town portion of the big cities became more and more expensive it became more and more necessary to make every square foot of it count for as much as possible. The erection of office-buildings several stories in height was the simplest way of solving this question. However, people were not willing to walk up more than three or four flights of stairs to reach their offices, and this fact naturally limited the height of the buildings. Then, too, the methods of construction in use in the middle of the nineteenth century would not have made a very tall building safe. The invention of steel beams for construction work about the middle of the last century made possible taller buildings, and the invention of the elevator in the sixties increased almost indefinitely the possible height of buildings. The Tacoma Building in Chicago was the first steel-construction "sky-scraper." To-day that building can scarcely rank with the "sky-scrapers." The cuts given here show the Tacoma Building and the Woolworth Building in New York, with its fifty-five stories, which is to date the tallest office-building ever erected in the United States.

We need not think just because the "sky-scraper" had its origin in purposes of utility that it is a prosaic structure, unfit to rank

with great architectural achievements of the past. True, it is not grand as a Greek temple is grand, or beautiful as a Gothic cathedral is beautiful, but it is very wonderful, nevertheless. Of course it must be fireproof, and, consequently, little wood goes into the making of it, but it contains steel enough to build over one hundred locomotives;

TACOMA BUILDING, CHICAGO
The first steel-construction building ever erected.

literally miles of metal piping; acres and acres of terra cotta blocks; millions of bricks; thousands of tons of mortar; hundreds of tons of paint; almost one hundred thousand square feet of glass, and miles of elevator cables. All in all, perhaps nothing represents so well the crowding of people in our American cities, together with their ideals of utility combined with beauty, as does the modern "sky-scraper."

Architecture of the Past. In the following pages is given a summary of the past development of architecture.

Egyptian Architecture. The Egyptians are the most ancient nation known to us among whom architecture had attained the character of a fine art. Their first permanent buildings were excavated tombs, massive pyramids and primitive temples. The belief of the Egyptians that the present life was but a moment in comparison with eternity and that the body must be preserved for the soul to inhabit, was responsible for the architecture of the tombs, which were supposed to be built so strong that time could not destroy them nor an enemy rifle them. The Egyptian temples had walls of great thickness that sloped on the outside from bottom to top; the roofs were flat and composed of blocks of stone reaching from one wall or column to another, for the principle of the arch was not employed. Statues of enormous size, sphinxes carved in stone, and the outlines of deities and animals sculptured on the walls, with innumerable hieroglyphics, are the decorative objects which belong to this style. Architecture was the one supreme art in Egypt—painting and sculpture always were subordinate to it (see PYRAMIDS; SPHINX).

Chaldean-Assyrian Architecture. The Chaldeans built with sun-dried brick, as there was no good stone in their country, and the Assyrians followed their example, covering the bricks with beautifully carved stones and stucco. Magnificence and beauty, rather than permanence, was their special aim. Vaults and arches were used, and as a result large rooms were possible. Their temples were in the shape of pyramids and were composed of terraces rising in tiers to a great height.

Other Ancient Architecture. The Hittites and Phoenicians followed the Assyrians in general style. They built heavy fortresses, great palaces, and temples which were small and inferior as compared with those of other nations. Their buildings have not stood the test of time. The Hebrews had no national architecture and what is known is derived only from historical accounts (see TEMPLE). Oriental architecture developed by itself, and lacks the permanency of the West. Although many widely differing styles are to be found in India, the oldest and only true native style of Indian ecclesiastical architecture is the Buddhist, the earliest specimens dating to

250 B. C. Among the chief objects of Buddhist art are *stupas* or *topes*, built in the form of large towers and employed to contain relics of Buddha or of some noted saint. Other works of Buddhist art are temples or monasteries, excavated from the solid rock and supported by pillars of the natural rock left in place. The most remarkable Hindu or Brahmanical temples are in southern India. They are pyramidal in form, rising in a series of stories. The Chinese have made the *tent* the elementary feature of their architecture, and roofs are concave on the upper side, as if made of canvas instead of wood (see PAGODA).

Greek Architecture. In historic times the Greeks developed an architecture of noble simplicity and dignity, in part derived from the Egyptian. The earliest Greek architecture was rough and coarse, immense bowlders, piled one upon another, having been used for walls, as shown in the city of Tiryns. Architecture is considered to have attained its greatest perfection in the age of Pericles, or about 460–430 B. C. The great masters of this period were Phidias, Ictinus and Callicrates. The style is characterized by beauty, harmony and simplicity in the highest degree. The Greeks had three orders, called, respectively, the *Doric, Ionic* and *Corinthian* (see COLUMN). Greek buildings were abundantly adorned with sculptures, and painting was extensively used, the details of the structures being enriched by different colors or tints. Lowness of roofs and the absence of arches were distinctive features of Greek architecture.

The most remarkable public edifices of the Greeks were temples, of which the most famous is the Parthenon at Athens. They were at first very simple structures, but they were characterized by grace and simplicity, and they later reached the highest perfection of architectural beauty. These temples were usually built on a base of three low terraces. The shape was rectangular, and outside were rows of columns, the outer of which supported an entablature. The large room in the center was the sacred shrine (see ERECTHEUM; PARTHENON; THESEUM). Their theaters were semicircular on one side and square on the other, the semicircular part being usually excavated in the side of some convenient hill. This part, the auditorium, was filled with seats arranged in concentric circles, and could contain 20,000 spectators. A number exist in Greece, Sicily, Asia Minor and elsewhere (see THEATER).

Roman Architecture. The Romans early took the foremost place in the construction of such works as aqueducts and sewers, the arch being extensively used (see CLOACA MAXIMA). As a fine art, Roman architecture had its origin in copies of the Greek models, but it added two new orders—the *Tuscan* and the *Composite* (see COLUMN). Rome attained under Augustus its greatest perfection in architecture. Among the great works erected were temples, aqueducts, amphitheaters, magnificent villas, triumphal arches and monumental pillars. The *amphitheater* differed from the theater in being a completely circular or rather elliptical building, filled on all sides with ascending seats for spectators and leaving only the central space, called the *arena,* for the combatants and public shows (see COLOSSEUM). The *thermae,* or baths, were vast structures in which multitudes of people could bathe at once. The excavations at Pompeii in particular have thrown great light on the internal arrangements of the Roman dwelling-house. After the period of Hadrian (A. D. 117–138) Roman architecture is considered to have been on the decline (see PANTHEON).

Byzantine Architecture. In Constantinople, after its virtual separation from the Western Empire, arose a style of art and architecture which was practiced by the Greek Church during the whole of the Middle Ages. This is called the Byzantine style. The church of Saint Sophia at Constantinople, built by Justinian, who reigned from 527 to 565, offers the typical specimen of the style. Saint Mark's in Venice is one of the most striking examples of the later phase of the same form. In the typical examples the dome or cupola rests on four pendentives (see PENDENTIVE; SOPHIA, CHURCH OF SAINT). After the dismemberment of the Roman Empire the beautiful works of ancient architecture were almost entirely destroyed by the Goths, Vandals and other barbarians; or what was spared by them was ruined by the fanaticism of the Christians.

Romanesque Architecture. A new style of architecture then arose, of which the semicircular arch is the characteristic feature. Towers, porches, crypts, ornamented façades in stone, the vault in the form of a tunnel, the groin and ribbed-groin were other notable features of this type. Examples of this

LEADING TYPES OF ARCHITECTURE

1. Egyptian—Pylon of the Temple at Karnak.
2. Greek—Theseum.
3. Italian Renaissance.
4. Gothic—Cathedral at Milan.
5. Gothic—Sir Walter Scott's Monument, Edinburgh, Scotland.
6. Early Gothic—Notre Dame, Paris.
7. Modern—Triumphal Arch, Milan.
8. Modern Steel Construction.

Guide to the Study of Architecture

I. Historical Development, and Styles of Architecture—

Architecture
Egyptian
Chaldean-Assyrian
Other Ancient
Greek
Roman
Byzantine
Romanesque
Gothic
Renaissance
Recent
Decorated Style
Elizabethan Architecture
Flamboyant
Indian Architecture
Mohammedan Architecture
Norman Architecture
Perpendicular
Tudor Style

II. Kinds of Buildings—

Basilica
Bungalow
Campanile
Castle
Cathedral
Mosque
Pagoda
Round Towers
Temple
Tower

III. Parts of Buildings—

Apse
Arcade
Arch
Bay Window
Beam
Bracket
Buttress
Chancel
Chimney
Cloister
Column
Console
Crypt
Cupola
Dome
Dormer Window
Entablature
Façade
Gable
Loggia
Mansard Roof
Minaret
Nave
Pediment
Pier
Rose Window
Spire
Transept
Vault
Window

IV. Ornamentation—

Caryatides
Corbel
Fan Tracery
Gargoyle
Moldings
Pendant
Tracery

V. Famous Buildings—

Questions on Architecture

What is architecture? To what remote period can we trace it?

For how many years did Cheops employ men to erect the great pyramid? How many acres does it cover?

What is the height of the great pyramid? What does its interior contain?

What special claim have the Egyptians to distinctive architecture? Was architecture their supreme art?

With what were the temples, tombs, and statues of Egypt decorated?

What place in Egypt because of its many pyramids is called the "Westminster Abbey of Egypt"?

What is the generally accepted belief as to the construction of the pyramids? How did the length of a king's reign affect the size of the monument?

How were the Buddhist temples built out of solid rock?

What characterized the early Greek architecture? Who were the three great architects of Greece?

How would the seating capacity of the larger Greek theaters compare with those of to-day?

The Parthenon in the Acropolis at Athens is said to be the most perfect building ever erected. When was it built? Of what material? How long is it? How broad? How high? How many pillars did it originally have?

Describe the Pantheon at Rome.

Are we justified in classing architecture as one of the arts? Why?

What particular type of building have American architects developed in recent years?

What is a mosque? What is considered the most perfect mosque in the world?

What people developed the arch to its highest type? Had the arch been known at all before their time?

What are Caryatides? What are Cleopatra's Needles? Where are they now?

What are the distinguishing features of Gothic architecture? Of the Renaissance style? Of the Elizabethan style?

In what countries is Mohammedan architecture chiefly represented? What are its most prominent features?

When was Norman architecture introduced into England? What are its specific characteristics?

style are the Church of San Ambroglio, Milan; the Abbey of Vezelay in Central France, and the cathedrals at Speyer and Worms and along the Rhine border.

Gothic Architecture. This term is applied to the various styles of pointed architecture prevalent in western Europe from the middle of the twelfth century to the revival of classic architecture in the sixteenth. The style grew out of the attempts on the part of the architects of the eleventh and twelfth centuries to perfect a system of vaulting. The Gothic type made use of the pointed or ribbed groin-vault, which substituted a more nearly vertical pressure than had been exerted in any of the forms used up to this time, and thus allowed the supporting piers to be made smaller, leaving large spaces for the windows. The chief characteristics of Gothic architecture are the predominance of the pointed arch and the subserviency and subordination of all the other parts to this chief feature; the tendency through the whole composition to the predominance and prolongation of vertical lines by the use of large windows filled with costly stained glass; the absence of the column and entablature of classic architecture; the absence of square edges and rectangular surfaces and the substitution of clustered shafts and contrasted surfaces. This style orignated in France and spread very rapidly to England, Germany, Italy, Spain and the Scandinavian countries.

It is in the cathedrals and churches that we find the highest development of Gothic architecture. The cathedral of Cologne, Notre Dame at Paris, and the cathedrals at Amiens and Rheims, (they were bombarded by the Germans) furnished excellent examples of this style of architecture. In the rich decoration, the characteristic feature is the recourse to models of nature, animals and flowers of every variety being used. No other art has so beautifully reproduced flowers and foliage in stone. The several periods of Gothic architecture are clearly marked by the form and general treatment of the windows (see CATHEDRAL; WINDOW).

Renaissance Architecture. The Gothic style was introduced into Italy, but it was never thoroughly naturalized. The Renaissance style soon superseded it. This was a revival of the classic style, based on the study of the ancient models, which commenced in Florence about the beginning of the fifteenth century, spread with great rapidity over Italy, and gradually over the greater part of Europe. The great aim was to make ornamental rather than useful buildings. The most illustrious architects of this early period of the style were Brunelleschi, who built at Florence the dome of the cathedral and the Pitti Palace, besides many edifices at Milan, Pisa, Pesaro and Mantua; Alberti, who wrote an important work on architecture and erected many admired churches; Bramante, who began the building of Saint Peter's, Rome, and Michelangelo, who erected its magnificent dome. On Saint Peter's were also employed Raphael, Peruzzi and San Gallo. The period began early in the fifteenth century and continued through to the nineteenth, never producing a distinct style of its own, but modifying the forms which existed. The noted examples of this style, outside of those already mentioned, are the Louvre, the Tuileries, the Luxembourg and Versailles in France; the Heidelberg Schloss in Germany and Saint Paul's and Blenheim in England.

ARCH OF TRIUMPH, in French, "Arc de Triomphe de l'Etoile," *ahrk de'tre'oNf' de la twahl'*, the largest triumphal arch in the

ARC DE TRIOMPHE

world, located at Paris. It was begun by Napoleon in 1806 to commemorate his victories. The whole structure is 160 feet high

and nearly 150 feet long. The arch is inscribed with the names of Napoleon's greatest victories. It is erected at the head of the beautiful boulevard known as Champs Elysées.

ARCHON, *ar'kon,* in ancient Athens an executive official who governed after the kingship was abolished. The first archon, selected by the nobles from the royal family of Codrus, was appointed for life, but in 752 B. C. the term of office was designated as ten years. Later the number of archons was increased to nine and they were selected annually. After 508 B. C. these officials were chosen by lot. Six were lawmakers; one, called the *Polemarch,* had charge of military affairs; another supervised religious matters, and the first archon gave his name to the year in public records.

ARC'TIC CIRCLE, an imaginary circle on the globe, parallel to the equator and 23° 28′ distant from the North Pole. Its location marks the southern limit of the sun's rays shining over the North Pole in the summer time. The name Arctic comes from *Arktos,* the Greek name of the constellation Bear.

ARCTIC OCEAN AND LANDS, that region of water, snow and ice which surrounds the North Pole. The name Arctic Ocean is applied to the waters that wash the northern shores of Europe, Asia and America, and communicate with the Pacific by Bering Strait and with the Atlantic by a wide passage between Greenland and Norway. The great rivers, Obi, Yenisei and Lena, in Asia, and the Mackenzie in Canada, empty into this ocean. The Arctic Ocean encloses many large islands and has a number of bays and gulfs which deeply indent the adjacent continents, as Baffin's Bay, the White Sea and the Gulf of Obi. The water region around the pole is covered with great fields of ice, which are frozen together in winter, but become separated in summer. Animal life is very abundant in the Arctic, the lower forms being numerous in the deepest as well as in the surface waters. Of the fishes the most common are the cod and the polar shark. Mammals are more highly developed here than in any other part of the oceanic waters, and include the whale, the narwhal, the seal and the walrus.

The land surface of the Arctic Zone has not been thoroughly explored, but considerable is known of its main features. The Arctic or North Polar Circle just touches the northern headlands of Iceland, cuts off the southern and narrowest portion of Greenland, crosses Fox's Strait north of Hudson's Bay, and then goes over the American continent to Bering Strait. Thence it runs to Obdorsk at the mouth of the Obi, then crossing northern Russia, the White Sea and the Scandinavian Peninsula, returns to Iceland. The mean annual temperature within the Arctic Circle is below 32° F., and the plants and animals are such as are adapted to a cold climate. The polar bear, walrus and some species of seals are found and the reindeer and Eskimo dog have been domesticated. The inhabitants are Eskimos, Lapps and Finns, for a description of which see articles under their respective titles. Valuable minerals and fossils have been discovered within the Arctic regions. In the archipelago north of the American continent excellent coal frequently occurs. The mineral cryolite is mined in Greenland. Fossil ivory is obtained in the islands at the mouth of the Lena. In Scandinavia, parts of Siberia and northwest America, the forest region extends within the Arctic Circle. See NORTH POLAR EXPLORATIONS.

ARCTU'RUS, a fixed star of the first magnitude in the constellation of Boötes, thought by some to be the nearest to our system of any of the fixed stars. Though it takes 125 years for its light to reach the earth, it is a noticeable object in the northern heavens, and may be found by means of the Big Dipper. Follow the curve of the three stars forming the handle, and you will see in the line of direction this star of ruddy hue.

ARD'MORE, OKLA., the county seat of Carter County, situated 100 miles south of Oklahoma City and the same distance north of Fort Worth, Texas. The Santa Fe, the Frisco and Rock Island and the Oklahoma, New Mexico & Pacific railroads serve the city. The Bloomfield Academy is here, and there is a Carnegie Library and a public sanitarium. Twenty-two acres are in two parks. The commission form of government is in force. The Federal building, completed in 1916, cost $185,000. The court house is nearly as fine a building. Population, 1910, 8,618; in 1917, 10,963 (Federal estimate).

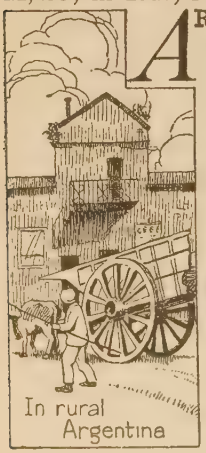
ARE'CA, a genus of lofty palms which have feather-shaped leaves, and bear a one-sided berry or nut enclosed in a fibrous rind. One species of the Malabar coasts is the com-

mon areca palm, which yields areca or betel nuts, and the astringent juice catechu. See Betel; Cabbage Palm.

ARECIBO, *ah ra se'bo*, a town of Porto Rico, situated on the north coast, forty miles west of San Juan. The town is arranged around a central plaza or square, which is surrounded by a church and other public buildings. The buildings are of wood or brick. Arecibo is of some commercial importance, but its harbor is poor and can be entered only by vessels of light draft. Sugar is exported. Population, 1910, 9,612.

AR'EOP'AGUS, the oldest of the Athenian courts of justice. It obtained its name from its place of meeting, on the Hill of Ares (Mars), near the citadel. It existed from very remote times, and the crimes tried before it were wilful murder, poisoning, robbery, arson, dissoluteness of morals and innovations in the State and in religion.

ARGENTA, *ahr jen'ta*, Ark., founded in 1870, a city in Pulaski County, on the north side of the Arkansas River, directly opposite Little Rock. The city has numerous manufacturing plants, employing about 4,000 men; large railroad shops, cotton compresses and cottonseed-oil mills are the principal industrial enterprises. Population in 1911, 11,138; in 1917, 15,515 (Federal estimate).


In rural Argentina

ARGENTINA, *ahr jen te'nah*, or the Argentine Republic, is second only to Brazil in size among the countries of South America. Among Spanish-speaking countries it is the largest on the continent, and also the most populous and the most rapid in development. Its length is about 2,209 miles—from 22° S. to 55° S, corresponding in length and in latitude to the distance from Northern Cuba to the main part of Hudson's Bay. It varies in width from 1,000 miles in the north—farther than from New York City to Chicago—to 200 miles in the south. Its area is 1,153,119 square miles; population, 7,885,237 (1912). About one-fifth of the people live in Buenos Aires, the capital city. In some parts of the country there is an average of but one person to three square miles. The distance from Buenos Aires to New York is 4,370 miles.

Chile shuts Argentina from the ocean on the west; Bolivia, Paraguay, Brazil, Uruguay and the Atlantic Ocean are on the north and east. The ocean and Chile are on the south.

Surface and Drainage. The larger part of Argentina is a low or rolling plain, rising gradually from the coast to the mountains in the west. In many respects this plain resembles in its surface, climate and vegetation the great central plain of the United States. In the northeastern portion of the country considerable areas are covered by the extension of the Brazilian highlands. A section between the Parana and Uruguay rivers is low, with the exception of the extreme northeastern portion, into which some of the Brazilian mountains extend. The surface of the western portion of the country is hilly or mountainous, containing peaks that exceed 17,000 feet in altitude. The highest of these, Aconcagua, lies just west of the dividing line between Argentina and Chile.

Argentina has about 1,500 miles of coast line. It is drained in the north by the La Plata river system, which consists of the Parana and its tributaries and the Uruguay. The most important tributaries are the Parana from the north, the Pilcomayo the Vermejo and the Salado. The central part of the country is drained by the Rio Colorado and Rio Negro, which flow into the Atlantic. The southern portion is traversed by the Chubut, the Chico and the Santa Cruz. Among the foothills of the Andes are numerous lakes, some of which are remarkable for their beauty, and in the plains are a few lakes which have no outlet and are surrounded by soft marshes.

Climate. In location, Argentina corresponds in the southern hemisphere to that portion of North America extending from the latitude of Cuba to that of Hudson Bay, and it has in the lower lands a climate similar to those regions, with the exception that the warm regions are in the north and the cold in the south. The lowlands are divided into three climatic belts. The first, extending from the northern boundary to the latitude of Rosario, has a tropical or semitropical climate. The middle belt, extending from Rosario to about the 42nd parallel of latitude, has a temperate climate similar in nearly all respects to that found in the mid-

dle Atlantic and central states of the United States. South of this is the colder belt, having a climate resembling that of the north central states and certain portions of Canada, with the exception that in neither of the regions are found the extremes of heat and cold which characterize the interior of North America.

The rainfall in the northern portion varies from fifty to seventy inches annually. South of this, in the temperate belt, it is somewhat less, and it diminishes rapidly as it advances inland. The southern belt is dry. In the northern and central portions of the country there is ample rainfall for all agricultural purposes, and in the southern portion the precipitation is sufficient for grazing.

Mineral Resources. In the mountainous regions are found extensive deposits of iron, copper, lead and silver, and gold has been found both in the mountainous regions and on some of the rivers. There are also valuable deposits of soda and borax, and coal occurs in the southern provinces. Petroleum has also been found in a few localities. As yet none of these deposits has been worked to a great extent, but there are in Argentina all the minerals required for the needs of man.

Agriculture. The country is favorably situated for agriculture, and this is by far the most important industry. The northern belt is given to the growth of grains and tropical fruits, sugar cane and cotton, while the central belt is especially adapted to the growth of wheat, oats, barley, potatoes, flax and all other agricultural products suited to the temperate regions. Wheat is by far the most important crop, and the annual yield averages in value about $95,000,000. Stock-raising is also an important industry. The central belt is especially suited for this, since it contains many square miles of excellent grazing land. It is estimated that Argentina contains over 25,000,000 cattle and 100,000,000 sheep, and it has become one of the leading countries in the production of wool. Its meat now helps to feed the world.

Manufactures. The manufacturing industries are still limited. In general they are along those lines which work up the raw material of the country into finished or partially finished products. Among the important manufactories are flour mills, meat-packing establishments, breweries, sugar refineries and tanneries. There are also important manufactures of other food products, and the manufacture of clothing, boots and shoes and small wares is assuming some prominence.

Transportation. The La Plata river system and its tributaries afford the northern portion of the country ready access to the sea. Large steamers ascend the Parana for 1,200 miles, and the river is navigable for lighter boats its entire length. Many of its larger tributaries are also navigable. The country contained 24,880 miles of railroads in 1916, and the lines are so constructed as to join together all the important cities and towns in the northern and central portions. Lines are also constructed in the southern territories, and a transcontinental line connects Buenos Aires with Santiago in Chile. Electric railways are found in all of the large cities and important towns, and excellent telegraph and telephone systems are owned and operated by the government.

Commerce. The commerce of Argentina is more extensive than that of any other South American country. Its annual average is about $450,000,000. The imports consist of manufactured products of all kinds, especially textiles, agricultural implements and railway supplies. The important exports are wheat, flour, dressed meat, hides and tallow. Great Britain has the largest share of foreign trade, followed, in the order of their importance, by the United States and France. Previous to the World War Germany held second place.

Inhabitants and Language. The early inhabitants were indians who resembled in their civilization the Incas of Peru. When the Spaniards conquered the country and settled there, many of them intermarried with the indians, and the inhabitants of the interior consist of a mixed race descended from these early marriages. Since the middle of the nineteenth century immigration has been encouraged, and now more than half of the population are immigrants or their descendants. Among these, Italians and Spaniards predominate. Next in order are the French, English and Germans. Spanish is the prevailing language.

Education. The country has a good system of public schools, which is organized and supervised by the department of public instruction. Each province is held responsible for the public schools within its own boundaries, and these are managed on a plan

somewhat similar to that in vogue in the different states of the United States. Education is compulsory for all children between six and sixteen years of age, though in the outlying provinces this requirement is not well enforced. The government maintains normal schools, a national university and technical schools.

Government and Religion. The government of Argentine closely resembles that of the United States. The national legislature consists of two branches, a senate and a house of representatives. The senate consists of thirty members, and is made up of two senators from each of the provinces. These are elected by the legislatures for the term of nine years, and the terms of one-third of the senate expire every three years. The number of members in the house of representatives is based upon population. In 1913 it was 120. The members are elected for four years by the people. The terms of one-half the members expire every two years. The president is elected by electors chosen in the different provinces. His term is for six years, and he is not eligible for reëlection. For local administration the country is divided into fourteen provinces and ten territories. Each province has its local legislature, and the executive is independent in the management of its own affairs. The Roman Catholic Church is recognized as the State church and this faith is embraced by more than nine-tenths of the inhabitants, though other religions are tolerated without objection.

Cities. The important cities are Buenos Aires, the capital; Bahia Blanca, Rosario, La Plata and Cordova.

History. Argentina was first visited in 1515 by Juan Diaz de Solis. Twelve years later Sebastian Cabot ascended the Parana and gave to the La Plata its name. He founded a colony on the river, but it was soon destroyed, and no permanent settlement was established until 1580. For nearly two centuries the settlements in Argentine were attached to the vice-royalty of Peru, but in 1776 the basin of the La Plata was made an independent vice-royalty. Later the provinces came under the rule of Spain, where they remained until 1816, when Argentina gained its independence.

For the next fifty years the history of the country was one of internal strife, in which rebellions, revolutions and wars with neighboring states were so frequent that the development of the country's resources was impossible. The present constitution was adopted in 1853, and under it the country has gained its present prosperous condition. Argentina has had numerous boundary disputes with is neighbors, especially serious being those with Chile, which were finally arbitrated in 1902. On the boundary line between the two nations, high on a crest of the Andes, is a great statue, *Christ of the Andes,* erected to commemorate a lasting peace. Another important event was the adoption of the gold standard in 1900, the

CHRIST OF THE ANDES

A great peace statue erected by Chile and Argentina on the boundary between the two countries.

"On the level summit of the pass stands the Christ of the Andes, a bronze statue of more than twice life size standing on a stone pedestal rough hewn from the natural rock. . . . There had been a long and bitter controversy between Chile and Argentina over the line of their boundary along the Andes, a controversy which more than once had threatened war. . . . After years of careful inquiry an award was delivered and a boundary line drawn in which both nations acquiesced. Grateful for their escape from what might have been a long and ruinous strife, they cast this figure out of the metal of cannon, and set up here this monument of peace and good-will, unique in its place and in its purpose, to be an everlasting witness between them."

JAMES BRYCE

value of the paper dollar being fixed at forty-four cents gold.

In the World War Argentina remained neutral, though it was frequently on the point of severing relations with Germany.

Related Articles. Consult the following titles for additional information:

Aconcagua	Patagonia
Andes	Pilcomayo
Bahia Blanca	Rio de la Plata
Buenos Aires	Rosario
Cordoba	Santa Fe
La Plata	Tierra del Fuego
Mendoza	Tucuman
Parana	Uruguay River

AR'GON, a gas forming less than one per cent of the atmosphere. It was discovered in 1894 by Lord Rayleigh and Professor Ramsey. It resembles nitrogen very closely, but is somewhat heavier. Its most marked property is its extreme inactivity.

AR'GONAUT, a name given to a species of cuttlefish known also as the *paper nautilus* or *paper sailor*. This is the animal so celebrated in poetry, which was falsely supposed to sail on the surface of the sea, using its two extended arms as sails and its other arms as oars. See NAUTILUS.

PAPER NAUTILUS

ARGONAUTS, the fabled heroes of Greece who made the voyage in search of the golden fleece. According to tradition, long before the Trojan War, Aenos, king of Thessaly, became tired of ruling and conferred the crown on his brother, Pelias, on condition that he should rule only until Jason, the son of Aenos, became of age. When Jason reached the required age and demanded the crown of his uncle, Pelias seemingly complied, but suggested that Jason and his companions could gain great renown by going in search of the golden fleece, which was known to be in the distant land of Colchis, on the shores of the Euxine (Black) Sea.

In accordance with the suggestion, the young heroes planned for the voyage, the ship Argo was constructed for their service, and Jason and his companions, among whom were Orpheus, Castor and Pollux, Hercules and Theseus, started on their journey. After many adventures they reached Colchis, where they learned that the golden fleece was kept suspended from the branches of a tree and guarded by a dragon that never slept. Through the assistance of Medea, the daughter of the king of Colchis, a powerful sorceress, a deep sleep was made to fall upon the dragon. Jason captured the golden fleece and departed for Thessaly, taking Medea with him. This legend probably had its origin in some early voyage of discovery. See JASON.

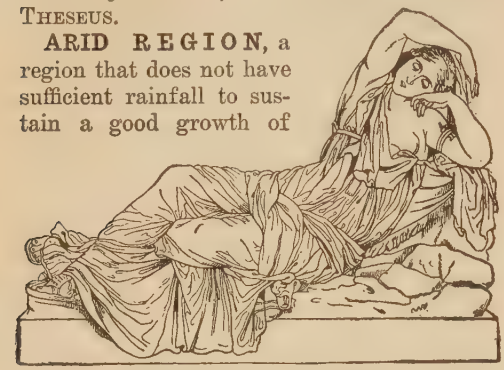
AR'GUS, in Greek mythology, a fabulous being said to have had a hundred eyes. This monster was placed by Juno to guard Io, whom she hated. Hence, the term "argus-eyed" is applied to one who is exceedingly watchful.

ARGYLL, *ahr gile'*, GEORGE JOHN DOUGLAS CAMPBELL, eighth Duke of (1823–1900), statesman and author. As a parliamentary orator he attained high rank, and some of his writings are important; chief among them is *The Reign of Law*. His eldest son, the Marquis of Lorne, married Queen Victoria's daughter, the Princess Louise, in 1871.

ARGYLL, JOHN DOUGLAS SUTHERLAND CAMPBELL, ninth Duke of (1845–1914), formerly Marquis of Lorne, English statesman and author. From 1868 to 1878 and again from 1895 to 1900 he served in the House of Commons. He married in 1871 the Princess Louise, daughter of Queen Victoria. In 1878 he was made governor-general of Canada, and his five-year administration was exceedingly popular. He became Duke of Argyll in 1900. Among his writings are *The United States after the War, Imperial Federation, Psalms in English Verse* and *Life and Times of Queen Victoria*. For illustration, see article GOVERNOR-GENERAL.

ARIAD'NE, in Greek mythology, a daughter of Minos, king of Crete. She gave Theseus a clue of thread to conduct him out of the Labyrinth after his defeat of the Minotaur, and when he left the country he

took her with him. He abandoned her, however, on the Isle of Naxos, where she was found by Bacchus, who married her. See THESEUS.



THE SLEEPING ARIADNE
In the Vatican galleries, Rome.

ARID REGION, a region that does not have sufficient rainfall to sustain a good growth of vegetation. Deserts are arid regions, but desert conditions are not necessarily found in all arid regions. The name applies particularly to that portion of the United States which does not receive sufficient rainfall to admit of the successful raising of crops. This region includes Montana, Wyoming, Colorado, Utah, Nevada, Arizona and New Mexico, the western portion of the Dakotas, Nebraska, Kansas, the northern part of Texas west of the hundredth meridian and a portion of Southern California. Another smaller region is found in Oregon and the southeastern part of Washington, extending into Idaho. The area of the arid region of the United States is about one and a half million square miles. Large portions of this region receive sufficient rainfall to support a growth of grass and are successful grazing regions. In all of them the soil is fertile and, when supplied with water, produces abundant crops. See IRRIGATION; DRY FARMING.

ARIES, *a'ri eez* (the ram), the first sign of the zodiac, measured from the vernal equinox. About 2,000 years ago, the sun was passing through this constellation in the spring, but now the sun is due the twenty-first of March in the constellation of Pisces, about 20° west. The symbol is ♈, the horns of a ram, or the nose and eyebrows of the human face.

ARI'ON, an ancient Greek poet and musician who was born at Methymna, in Lesbos, and flourished about 625 B. C. A fragment of a hymn to Poseidon, ascribed to Arion, is extant. The legend regarding him states that while he was on shipboard returning from Tarentum to Corinth, the sailors decided to put him to death for his wealth. After trying in vain to move them by his exquisite music, Arion threw himself into the sea, but he was saved by dolphins who had been attracted by his music and was carried to land.

ARIOSTO, *ahr yos'to*, LUDOVICO (1474–1533), a celebrated poet of Italy, born at Reggio, in Lombardy. His lyric poems in the Italian and Latin languages, distinguished for ease and elegance of style, introduced him to the notice of the Cardinal Ippolito d'Este, whose service he entered. The publication in 1515 of his immortal poem, the *Orlando Furioso* (Orlando Mad), made him at once highly popular. This poem details the chivalrous adventures of the paladins of the age of Charlemagne. Ariosto's other work includes severe satires in the spirit of Horace.

ARISTA, *a rees'ta*, MARIANO (1802–1855), a Mexican general. He took part in the war that established Mexican independence, and in 1836 was second in command to General Santa Anna. He commanded at Palo Alto and Resaca de la Palma, in the war between Mexico and the United States. In 1850 he became president of Mexico, but soon after his resignation in 1853 he was banished, and died in exile.

ARISTIDES, *ar is ti'deez*, (surnamed *The Just*) about 550–467 B. C.), a celebrated Athenian statesman and military commander. At the time of the Persian invasion under Darius, Aristides was one of the leaders of the Athenians. Owing to his influence and persuasion the chief command was given to Miltiades, instead of being changed daily among the ten generals, as had been customary. To this fact was due in great measure the important victory at Marathon (490). Shortly after this Aristides was appointed archon, but his rival, Themistocles, managed to secure his ostracism on the pretext that he was becoming dangerous to the democracy (484). In connection with this incident is told the familiar story of Aristides' writing his own name on the shell for an illiterate citizen who wanted to vote for his ostracism, and gave as his only reason that he was tired of hearing Aristides called *The Just*.

Such was his unselfish patriotism that during his exile he sought to unite the Grecian cities against the coming Persian

invasion, and before the Battle of Salamis (480) went to Themistocles and gave him his hearty support. He assisted in planning the engagement and himself took part in it and afterward commanded the Athenian forces. When the Delian League was formed, he took the chief part in its organization. Aristides was so poor at his death that he was buried at public cost, but from a grateful country his children received dowries and a landed estate.

ARISTOCRACY, *ar is tok'ra si,* a form of government in which the ruling power is vested in a few citizens of wealth or social prestige. Theoretically an aristocracy is a government of the best people, in which the dangers of mob rule are eliminated, but in actual practice the few men in control have usually worked for their own interests, and the government has become an *oligarchy.* England, after the accession of George I and on through the eighteenth century, was in effect an aristocracy, but with the development of the House of Commons, the extension of the franchise and the decline in power of the House of Lords, it has become a democracy. The term is used somewhat broadly at the present time in the sense of the *best;* as, for instance, when we speak of an aristocracy of intellect.

ARISTOPHANES, *ar is tof'a neez,* (444–380 B. C.), the greatest comic poet of ancient Greece, born at Athens. He appeared as a poet in 427 B. C., and having indulged in sarcastic comments on the powerful demagogue Cleon, was ineffectually accused by the latter of having unlawfully assumed the title of an Athenian citizen. He afterward revenged himself on Cleon in his comedy of *The Knights,* in which he himself acted the part of Cleon. His most important extant plays are *The Knights, The Clouds,* in which Socrates is ridiculed, *The Wasps, The Birds* and *The Frogs,* a satire on Euripides. His wit, though of a type not thoroughly appreciated to-day, has not been surpassed in any age or country.

ARISTOTLE (384–322 B. C.), the greatest of ancient philosophers and the founder of the Peripatetic School of Philosophy. At the age of seventeen Aristotle went to study at Athens, where he remained for twenty years. He was a favorite pupil of Plato, who called him "the intellect of his school." About 343 Aristotle became the teacher of Alexander the Great. After the conquest of Persia, Alexander presented him with nearly a million dollars and aided Aristotle's scientific researches greatly by sending him a specimen of any plant or animal unknown in Greece that was found on his expeditions. This friendship led the Athenians to accuse Aristotle of favoring Macedonia, and he was forced to flee to Chalcis, on the island of Euboea, where he died.

While at Athens Aristotle taught in the Lyceum, a gymnasium near the city, and his school is sometimes referred to by this name. The name *Peripatetic* has reference to the fact that he walked up and down in his garden while teaching; the word is derived from the Greek for *to walk about.* It was his custom to instruct his more intimate pupils in the problems of philosophy during the forenoon, and in the evening he gave public lectures to the people on less weighty subjects.

His Achievements. Aristotle was the creator of natural science. He was the first to divide the animal kingdom into classes, and came near discovering the circulation of the blood. His moral and political philosophy is based on the peculiarities of the human organism. To him is due the syllogism, the simplest form that an argument may assume. He was the first to distinguish the substance of things from their accidental characteristics; that is, matter and form. He established the so-called "cosmological argument" for the existence of God. This is, in substance, that everything in the world has a finite cause, and back of the long succession of finite causes there must be an infinite being, a first something, absolute reason, God.

Before the eleventh century Aristotle was but little known to the Christian world, although prized by the Arabians for three centuries prior to this. For four centuries he remained the authority of the Christian thinkers, but gradually his teachings became distorted and misunderstood. With the revival of learning his works were carefully studied and correctly interpreted, and their effect is felt in all subsequent philosophy, notably in Bacon, Kant, Spinoza and Descartes. Only a portion of Aristotle's writings have come down to us. Of his preserved works the most important are *Logic, Rhetoric, Poetics, Physics, Metaphysics, Ethics, Psychology, Politics, History of Animals, Meteorology.* See PERIPATETIC SCHOOL OF PHILOSOPHY; PHILOSOPHY; PLATO.

ARITHMETIC is that branch of mathematics which treats of the nature and properties of numbers and of computation by means of them. The idea of number is universal; we find no tribe, no matter how low in the scale of civilization, but shows some familiarity with the number idea; the suggestion of number appears in every language that has been studied. Although there may be found no definite word or symbol, there is discovered always some expression that indicates a conception of the difference between one and more than one. Indeed, the assertion is made that the idea of number seems to be understood by the higher orders of animals. Sir John Lubbock and others report observations to substantiate this. In children this idea is manifest at an early age. The infant learns the difference between one and two, and as soon as the child can move about he begins to count and measure. Even without any attention from others, by the time he has reached school age the child has acquired some knowledge of numbers, and if he has been assisted this knowledge is very helpful to him as he begins the systematic study of the subject.

Definition of Number. Dr. Dewey says, "Number is a product of the mind's action in making a vague whole definite. The conscious adjusting of means to end, particularly such an adjusting as requires comparison of different means to pick out the fittest, is the source of all *quantitative* ideas. *Quantity* means the *valuation* of a thing with reference to some end; what it is *worth;* its effectiveness compared with other possible means. These two conceptions are the beginning of all conceptions of quantity and number, and the sound basis of all dealing with them."

Subject Matter. The subject matter of arithmetic is number, which is defined above. The study of it may be divided into two parts: (1) the concrete problem, solved by finding the number relations in the concrete conditions which are before us; and (2) the abstract process, or the manipulation of the numbers growing out of the concrete problem. That this manipulation or technique may be facilitated, we do much abstract or drill work in arithmetic—as it were, to sharpen our tools.

Methods. *General Suggestions.* 1. The mind of the student acquires knowledge *through its own activity.* It develops through attention to problems that appeal to the individual, and for the solution of which he feels responsible. The teacher must not attempt to make short cuts by imposing his adult method upon the child. He must rather provide every opportunity, and take advantage of every condition that offers problems for solution, in the immediate experience and interest of the child, and must allow freedom in gathering material, and originality in finding methods and means of solution.

We are hearing and reading much at the present time of the *Project-Problem Method* in arithmetic. If we examine it carefully, we shall see that it is based upon the idea given above; namely, that the presence of a problem (if the problem is *real* to the student, and not imposed from above) implies an interest in adapting means to an end vital to the student.

PRACTICAL PROBLEMS

2. (a) Problems arising in the environment of the student and growing out of living conditions should form a large part of the work in arithmetic; (b) much opportunity should be given for spontaneous independent attack upon these problems for their solution, and (c) out of this should come the choice of method of solution. This

choice will be intelligent, and not the acceptance of our imposed method.

3. The child should weigh and measure; use scales, foot rule, yard rule and measuring tape; should estimate measurements and then verify his judgment by measuring; make market lists for provisions, clothing, fuel, and so forth.

4. *Home Problems.* Much material for arithmetic is to be found at home, and "home work" should be directed to take advantage of this material. The daily grocer's bill, weekly bill, monthly bill; the milk bill for week and month; reading of gas and electric light and water meters, and checking up of light, fuel and water bills are all fitting material for consideration in the arithmetic class. The child is able to find at home, also, much definite actual data concerning rates of commission, taxes, insurance, interest, wages and so forth, and the meaning of these subjects in the life about him. He may bring from home to class much reliable information concerning building, interior decorating, gardening, feeding of animals, sale of produce, and so on. With this home material the arithmetic work becomes to the student a formulation of number in the home and business life with which he is familiar.

ARITHMETIC AT HOME

The father, mother and other members of the household will be able to furnish much

WEIGHING APPLES

information to the student, and give him data for class work. They may make him acquainted with receipts and expenses, taxes, deeds, mortgages and property problems, as insurance, interest, etc.

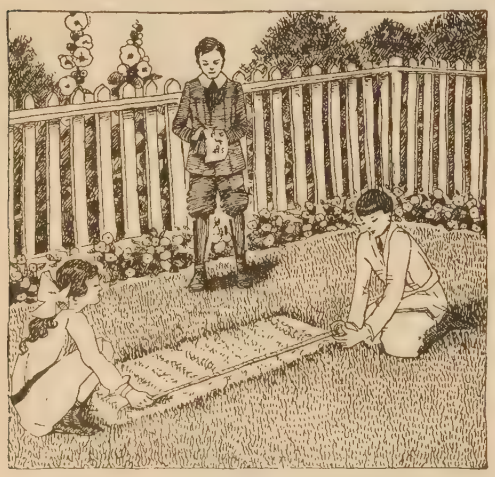
5. Facility in logic or technique is gained in the solution of the concrete problem, or the handling of the abstract, by many varied attacks upon the same principle, or process, rather than by repetition of the same attack. This will be illustrated in the work that follows in the outline for each grade.

Our System of Notation. Comprehension of our system of notation, and conscious appreciation of the advantages of the decimal system are essential to good work in arithmetic. Emphasis upon this in the early grades simplifies the fundamental processes, clarifies so-called difficult steps in these processes, and leaves nothing to be learned in decimal fractions but the need of a separatrix, or decimal point. This means a great saving of time in the later grades. As a matter of economy, then, as well as a matter of understanding, we should have our students familiar with the system of symbols with which we express number.

First Year

General Suggestions. The number work of this year grows out of the activities of the child—his work and play in school, his construction work and his games; his experiences as he goes to and from school; his home activities. In these concrete experiences he should come to appreciate simple number relations; to see again and again the same simple number facts; these he will formulate or tabulate in the next year.

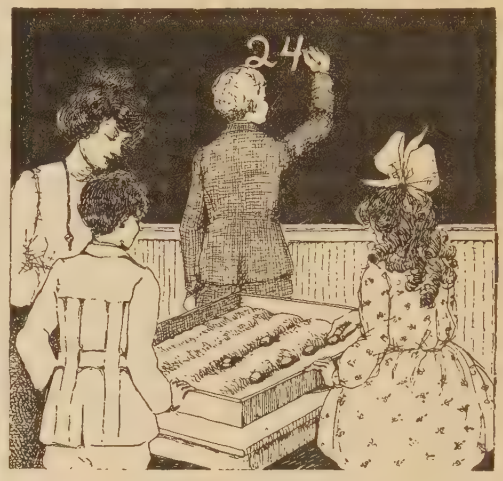
The child must find opportunity for measuring with definite units of measures, as a foot, an inch, a yard, an ounce, a pound, a quart, a penny, a dime, a dollar, a minute, an hour, a day, and others. He may measure the cardboard he uses in construction work; in his school garden, the spaces for the various vegetables and flowers and his own space in the garden; the table and desk and his playhouse; the distances he and his friends jump or run or throw, using the inch, foot or yard, as the lengths are short or long. As he measures he counts the number of yards or feet or inches, and finds occasion to add and subtract in finding the length of two jumps, the length of his lettuce bed and his neighbor's together, how much farther he jumps than his friend, the difference between the length and the width of the box he is making. The number activities begun at home or in the kindergarten are continued and developed.



SCHOOL GARDEN MEASUREMENTS

Outline of Work. 1. *Ideas.* Measure, count, recognize number sequence, count in one's, in two's, in ten's. Get the ideas of combining and separating; that is, of sum and difference. Get ideas of one-half, one-third, one-fourth.

2. *Expression.* *Gradually* learn the symbols, the 9 digits and zero. With the sand table and counters, and with the abacus, get the idea of *place value.* All these means of expression of the number ideas should be presented *very gradually.* The signs +, —, =, must come to have meaning through repeated translation of words into these signs, and of the signs back into words. For example, the child says, "I had 4 cents and mother gave me 3 cents," and the teacher writes 4 cents+3 cents, and interprets it as he points to each part, showing that "+" does the work of several words, and means



SAND TABLE

EXPRESSING NUMBER IDEAS

that the two quantities are to be combined and considered as one quantity. So each technical sign and expression as it is introduced should be understood through translation and interpretation.

Suggestions. (a) Train children to see instantly how many objects there are in a group of objects on the desk or table; in a group of marks on the blackboard, or on cards held up for the purpose.

(b) Let the children, for busy work, make great numbers of inch squares, 2×4 rectangles, etc. They are useful as counters, as material to use in objectifying the four operations, etc. Skill, exactness in measuring, and neatness are all gained in this training work. Scraps of colored paper from the printer or stationer add to the interest in this work.

(c) Make the denominate number work objective. Make many opportunities for actually measuring the inches in a foot on the board, or in construction; counting out the five cents that make a nickel. Remember that much repetition is needed in this basic work.

(d) Such terms as square inch, rectangle, triangle, circle, cubic inch, in connection with the form as it is used in class, should be used freely by the teacher, as the *definite* idea of form is growing in the child's mind.

Let children do much measuring.

(e) Provide a great number and variety of usable objects: foot and yard rules, scales, balances, one-inch cubes, pint and quart measures, scissors, paste and cardboard. The last three named make possible much seat work in making things explained in class, as boxes, envelopes, etc.

(f) Have many pennies, dimes and nickels, and a few quarters, half dollars and dollars; (real money is very desirable, as it is more interesting to the child than "toy money").

(g) Dominoes cut in large quantities by the children, from cardboard or paper, and dotted with brush and ink, make good material for many number games.

1. Let the pupils "match" ends.
2. Select all alike.
3. Place in rows, a given number in each row.
4. Find one with $\frac{1}{2}$, or $\frac{1}{3}$, or $\frac{1}{4}$ as many dots as another.

Problems for Solution. 1. How long do you think your desk is? Use your ruler to measure.

2. How wide do you think the window pane is? Measure.

3. Show me a block this size; one twice as large. Find one only one-half as large.

4. Measure, fold, and tear this piece of wrapping paper into three-inch squares for paste dishes.

5. Cut these half-inch strips into 3-inch lengths for paste sticks.

6. Mother gave you a dime. You spent 5 cents for candy. What change did you get back?

7. The milkman left 1 quart of milk at your house this morning. The baby will drink a pint. How much is left?

8. Six inches melted from an icicle that was 1 foot long. Show with your ruler how many inches were left.

9. What can you buy for a penny?

10. Would you rather have a nickel or a dime to spend?

11. What can you buy for a nickel? For a dime?

12. How many cents can you get in exchange for a nickel? Would you give a dime for two nickels?

13. How many nickels and pennies must your father pay on the street car for you and your mother and himself? If he gives the conductor a dime and a nickel, what change will he receive? If your father gives you that change, tell me what you could buy with it.

14. If each one at home has an egg for breakfast on Monday and on Friday, how many eggs will they eat both days for breakfast?

15. Mary paid 16 cents for some ribbon, and for a collar she paid 7 cents less. How much did the collar cost? How much did both cost?

CARDBOARD OR PAPER DOMINOES

16. Lester gave Charles 5 cents for a ball and had 4 cents left. How much had he at first?

17. How many fingers have you; how many thumbs? How many fingers and thumbs together have you?

18. Three spools of thread cost 12 cents; what is the cost of one spool?

19. Alice bought some oranges for 8 cents and some nuts for 3 cents and gave the storekeeper a 10-cent piece and a 5-cent piece. How much change was given back to her?

20. How many cents in four 2-cent pieces and a 5-cent piece?

21. A little girl bought 8 pears and had 5 more given her. How many more than a dozen had she then?

22. If two gallons of milk were spilled out of a full 10-quart pail, how many quarts would be left?

23. A room is 5 yards and 1 foot long; how many feet long is it?

24. If you drink 1 pint of milk every day for two weeks, how many pints will you drink? Can you tell how much it costs at 5 cents a pint?

Second Year

General Suggestions. With the number background of the first year, which consists largely of concrete experiences and observations of number relations, the child in the second year is ready (1) to become familiar with number facts, to master the facts which in the first year he observed in a general way, and to tabulate these facts in some convenient form, as in tables; (2) with his greater

DIFFERENT NUMBER IDEAS

maturity and more varied experiences, his outlook on concrete situations broadens, and his field for number experiences and observations is extended; his concrete problems are greater in number and more varied in kind than during the first year.

Outline of Work. 1. *Ideas.* Measure, count; meaning of sum and difference; know the 45 simple addition and subtraction facts. Get the idea of ratio, or times; see it as distinct from addition; pass from addition to multiplication; this means the development of the power of abstracting and generalizing; 6 is no longer merely 4 and 2, or 5 and 1, but is 6 times 1, or 2 times 3, or 3 times 2.

2. *Expression.* Reading and writing Arabic numerals to 1,000; Roman numerals to L, if used in the Second Reader; reading and writing time from the clock; easy work in dollars and cents; signs, +, −, ×, ÷, =, $, ¢.

3. *Processes.* (a) Simple addition and subtraction; numbers to be of not more than three orders.

(b) Tables through the 5's. Counting by 2's, 3's, 4's and 5's, using the tables stated.

(c) Simple multiplication and division; numbers to be of not more than three orders, each digit less than 6. Comparisons of numbers.

4. *Fractions.* Halves, fourths, thirds and sixths.

5. *Denominate Numbers.* Cent, nickel, dime, quarter, half-dollar, dollar; inch, foot, yard; pint, quart, peck; time in hours, half- and quarter-hours, using clock; degrees, using thermometer.

6. *Measuring.* Free measuring (using foot rule and yard stick) of parts of objects and of entire objects in the room; elementary work in area, using rectangles made by pupils.

7. *Problems.* In this grade children are much interested in each other; comparative height and weight interest them.

We measured Minna, Carl and Anna. Minna was 3 feet 6 inches high, Carl was 4 feet 1 inch high, and Anna 3 feet 9 inches high. Who is the tallest? How much taller is Anna than Minna.

Encourage the making of original problems like the above, involving one step only.

Often a problem of considerable difficulty is easily solved by pupils if connected with the work they like, as the following, correlated with nature work:

We find that the twig we measured grew 1¼ inches last year, and that this year it grew 2½ inches. How much more did it grow this year than last?

8. *Generalization.* I know how many pounds of candy I have and how many boxes I wish to put it in. How shall I find how much I should put into each box?

You know the length of one side of a square. How can you find the distance around it? Make a picture and explain.

Helps on the Outline. *Playing Store.* Playing store is a delightful occupation at this age. Almost every bit of formal grade work can be done through this medium. With real money or toy money interesting things may be bought and sold, United

States money read and written, bills for goods added, change made, ribbon measured by the inch and yard, nuts measured by the quart and peck; also problems may be suggested by the children themselves. In playing store many mothers will find an easy solution of rainy-day problems when the children are kept indoors. The regular school work can be kept up in this way. Below are several store problems appropriate to this grade:

1. Yesterday Carrie bought a dozen eggs for 20 cents. Three of them were bad. How much money did Carrie's parents lose?

2. You buy a piece of ribbon for 18 cents, some calico for 15 cents and 2 yards of muslin at 8 cents per yard. How much did they all cost?

3. The storekeeper charged 6 cents for a pint of nuts. I bought a quart and gave him 50 cents. How much money did I get back?

4. Berries cost 8 cents a quart to-day. If your mother gave you 40 cents, how many quarts could you buy? Would you have any of the money left?

5. There are 18 buttons on one card and 24 on another. What will both cards of buttons cost you at 10 cent a dozen?

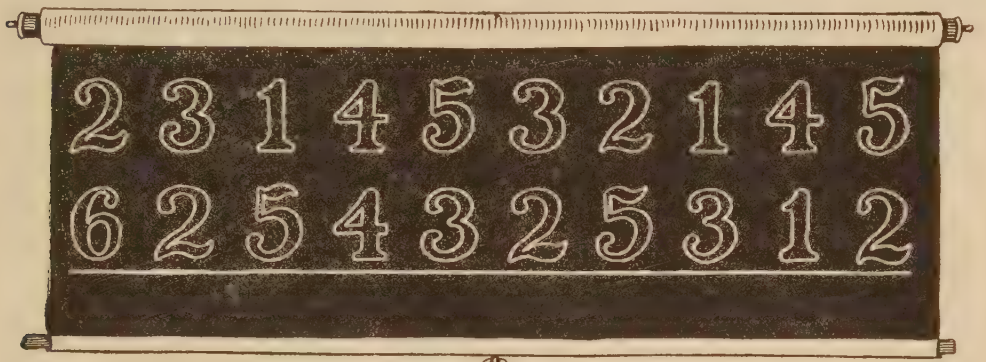
Addition at Sight. In adding columns of three or more figures, do not allow the pupil to add one figure at a time, especially after he has acquired a little experience. He should combine two consecutive figures and should finally give the result of three at sight. For example:

5
3 } He should think first, 7; then 12, and,
4 } after training, should say 12 at sight.

The teacher may place on the board a column of figures, as (a), below, then may use the same column in combinations or groupings, as (b), (c), (d) and (e). By adding another number at the top or bottom of the column, still other combinations are available.

(a)	(b)	(c)	(d)	(e)
4	4 }	4 }	4 }	4 }
2	2 }	2 }	2 }	2 }
5	5 }	5 }	5 }	5 }
6	6 }	6 }	6 }	6 }
4	4 }	4 }	4 }	4 }
3	3 }	3 }	3 }	3 }
7	7 }	7 }	7 }	7 }
4	4 }	4 }	4 }	4 }
8	8	8 }	8	8 }

Rapid calculations are advised for frequent exercises.



ROLLER CHART

Herewith is an illustration of a chart which can be very easily prepared by using an ordinary window shade roller and slated cloth. The figures can be put on the cloth permanently with chalk, or pasted on with mucilage, and for the pupil beginning addition the shade should be drawn so it will show but two rows of figures. As soon as two rows can be handled effectively the shade can be pulled lower and the third number may be presented. Such a combination of figures has been used in these two rows that no "carrying" is required. Therefore the work is kept in elementary form. The mother or teacher can hear the recitation or drill the pupil from the combination of these figures simply by the use of the pointer, and may save the time and avoid the diversion which would attend writing a series of figures on the blackboard.

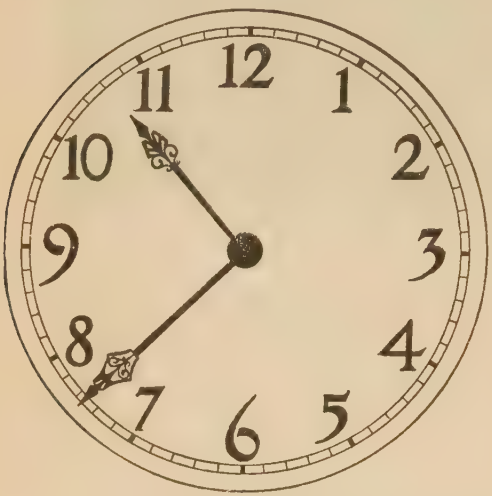
The Face of the Clock. The teacher or the mother can make excellent use of the clock face with pupils of this grade. In absence of a large clock in the room, you may use a piece of string and crayon and with these draw a large circle on the blackboard, which

may represent the clock face. Put in the Arabic rather than the Roman numerals at first, later changing them. Mark the hours, half-hours and quarter-hours. Draw and erase the hands as they change positions. The same drawing may be made for permanent use on a large sheet of cardboard. The hands may be loosely attached by tacks or by a paper-fastener. Questions may be asked as follows:

1. Show how far the hands travel in one hour; in ½ hour; in ¼ hour. If it takes you 15 minutes to walk to school, point out on the clock how far the minute hand goes in that time.

2. How much faster does the minute hand travel than the hour hand?

3. While the hour hand travels from XII to XII, how many times has the minute hand gone around the dial?

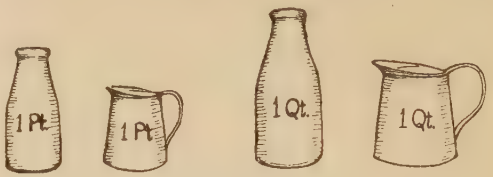


4. You should be at your uncle's house, one mile north of your home, at nine o'clock. You can walk four miles an hour; it is now a quarter after eight. How long before you must start if you will reach there promptly at nine?

Let the smaller children move the hands to time for school to begin, for noon, for school to close, etc.

When problems in time are given, or pupils are learning to tell time, have the little ones actually work with the thing; having the teacher point is not enough.

Denominate Numbers. The subject of denominate numbers should be learned by means of objects at hand, so far as is possible. If there may be before a class liquid and dry measures, measures of length and money in all small denominations, a vast amount of interest is added to the recitation and the work is made real and is understood. When a fact has been understood there should be problems relating to it. Below are



VISUALIZING DENOMINATE NUMBERS

a few problems which will be helpful in this connection and which may offer suggestions for many others of like nature:

1. Into how many yard-sticks can a stick be cut which is 36 feet long?

2. Into how many foot rules can you cut a stick 45 inches long? Would you have a short piece of stick left less than a foot long?

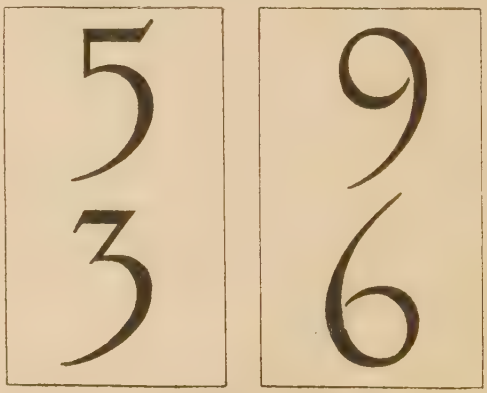
3. How many days in November, December and January?

4. Tommy played one hour and a half. How many minutes did he play?

5. A gallon measure holds 4 quarts. How many quarts will 9 gallons hold?

Actual measuring of things in the room and making problems from the measurements, cutting and tearing pieces of paper to a given size for a given purpose, etc., form a basis of work in measurement such as can be done later without using the rule, for the thing is understood.

Quick Work Games. The second, third and fourth grade teachers can use a set of



NUMBER CARDS

number cards in a great variety of ways. Let the children make, of odd bits of cardboard, cards about 3×5 inches, as seat-

work. These the teacher may make into sets of number cards by writing numbers on them in a bold, clear hand in ink. They may be used for drills, as follows:

(1) The teacher holds up one before the class, so that all may see for an instant, then takes it down. She then calls on some pupil for the sum, difference, or whatever process was decided upon before showing the card. This must be done rapidly.

(2) The card may be given to the child who gives the answer correctly first, each child trying to get as many cards as possible.

(3) Score may be kept by a monitor of the number each "side" has given correctly.

Directions for Making an Envelope. This may be made to hold language words, seeds, a letter, valentine, etc. The material needed is manila paper.

The children may cut (or tear) a six-inch square. Fold the square so that the two opposite corners will meet. With the base of the triangle toward you, fold the right-hand corner to the middle of the base. Paste. In the same way fold the left-hand corner. Paste. Fold the apex of the triangle to meet the middle of the base. Open. Then fold and paste the inner triangle to the middle of the base. Now tell them that since they have made this envelope so well with help, they may make one without assistance, for seat-work.

Such directions as the above may be written on the board with each step numbered as the children proceed. It may be left for the pupils to follow, by themselves, as soon as they are skilful enough to be left alone to carry out directions. The values in the work will appeal at once to the teacher.

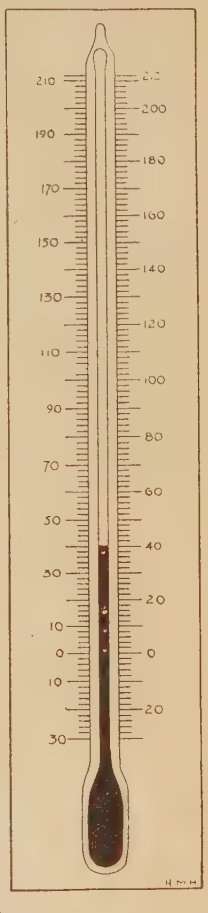
A TYPE LESSON FOR SECOND GRADE

Reading the Thermometer. This lesson is based on the use of the thermometer and is for the purpose of training the children in counting by 2's and by 10's. A common thermometer, which the children have been watching, may be used. Draw a diagram of a thermometer on the board, showing the degrees and spacing.

Teacher: All find the figure 0 on the drawing of the thermometer on the board. Jane, find it on the real thermometer, or heat measurer. Ralph, show with your finger how far the mercury rises when there is one degree of heat to measure.

Pupil: This is one degree.

Teacher: Show how high it rises to measure 10°, 20°, 30°, 40°, Lena.



Pupil: This is 10°; this is 20°, etc.

Teacher: To what point has it risen today?

Pupil: To here, between 30° and 40°.

Teacher: How many spaces are there between the marks 30° and 40°?

Pupil: There are five spaces.

Teacher: Mark off on the blackboard drawing the space between 30° and 40°. Into how many spaces are you dividing it?

Pupil: I'm dividing it into five spaces.

Teacher: How many degrees between 30° and 40°?

Pupil: There are ten degrees.

Teacher: And how many spaces did we say?

Pupil: Five spaces.

Teacher: Then how many degrees must each space stand for?

Pupil: Each space stands for two degrees.

Teacher: Count by two's.

Pupil: Two, four, six, eight, ten.

Teacher: Call the first space 32°, the second 34°, and so on.

Pupil: 32°, 34°, 36°, 38°.

Teacher: Now read the temperature for today, exactly.

Pupil: 34°.

Teacher: Count aloud and show the spaces from forty to fifty in the same way.

Pupil: Forty, forty-two, forty-four, etc.

Teacher: Now we have all counted by two's in pretty large numbers. Read the large spaces on the drawing of the thermometer, Cora.

Pupil: 0, 10, 20, etc.

Teacher: You have been counting by ten's. This is the way to write them:

2×10= 20
3×10= 30
4×10= 40
5×10= 50
6×10= 60
7×10= 70
8×10= 80
9×10= 90
10×10=100

They mean 2 tens are 20; 3 tens are 30; 4 tens are 40, and so on. All read them. Now write them on paper at your seats.

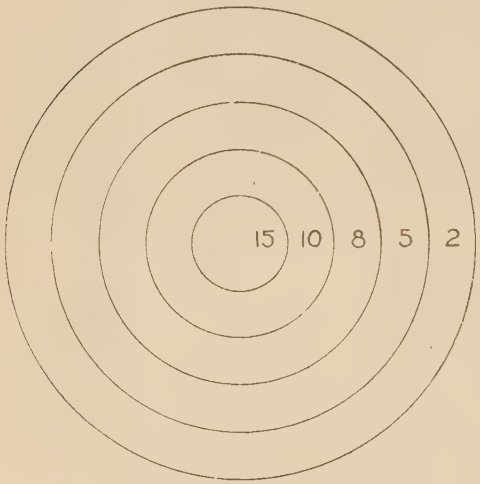
Quite aside from work with the class, it may be stated here that the teacher or parent would do well to consult authorities and

learn how a thermometer is made. Much of this information will not be too difficult to impart to some of the older pupils, and will enliven any session devoted to a study of the thermometer.

The thermometer may be drawn in "squared" paper and the mercury colored red or any color the child wishes. Squared paper adds much to the clearness of the representation and emphasizes the *number* values, and increases the joy in the work.

Suggestions for Games. 1. *Play Hide and Go Seek.* The person who is "it" counts by 10's to 100 while others hide, or counts by 5's to 50, or 5's to 100, giving more time to those who hide.

2. *Ring-Toss.* "Ringing" the post gives 20 points. Tossing into each circle gives 2, 5, 8, 10 or 15 points, as marked in the pic-



RING-TOSS DIAGRAM

ture. Give each child 3 throws or more, and count the scores as below:

Jane	Robert	Dorothy	Elmer
20	15	8	10
8	15	15	20
5	2	20	8

3. *Beanbag Game.* This game is much like ring-toss, but we substitute a beanbag for the ring and an inner circle for the post.

2	9	4
7	5	3
6	1	8

4. Make the "magic square". Let each child make one. Cut apart and try to put together again without looking at the one in the book.

5. *Number-Match.* Arrange and carry on as a spelling match, but in case of failure give a new problem, not repeating the one causing the failure.

(1) Each one who fails takes his seat, and the side that holds out the longer is winner; or (2) keep score, seeing which side gets the more points, all remaining in place to the end.

For other games, see the many number game books and new arithmetics.

Suggestive Home Problems. *Second Grade.* The following will be found very timely:

1. When your mother sends you to the store, how long does it take you? The next time she sends you to the store look at the clock and remember what time it is when you leave. Note the time again when you come home. How long did it take you to go and come?

2. How many bottles of milk does the milkman leave at your house each morning? How many does he leave in a week?

3. How many hours do you sleep? Tomorrow morning tell me how many hours you have slept. What time was it when you went to bed? What time was it when you woke up?

4. Your father pays 10c each day for carfare. How much money would he save in one week if he walked to work three days that week?

5. When your mother buys apples, count the number of apples in 1 peck. Find the number of potatoes in 1 peck.

Third Year

General Suggestions. The child takes up the number work of the third year with the advantage that comes from familiarity with the simple technique, signs and symbols of the science of arithmetic, and so is on the way to moving somewhat rapidly and independently. He met in the second year the first abstract number idea, that of times, or ratio, which gives him further advantage. He is ready to push on. Teachers must be careful that this advantage is not over-rated, and that the child is not pushed too rapidly. Up to this time the child has moved slowly and surely through his introduction to number, and everyone has been pleased to allow him to go leisurely. We find no failures, or very few, in first year number, some in second year, and a rapid rise in failures in third year. The school must not press so hard and so fast at this time. A more careful distribution through the first three years is to be desired. At this point the teacher must prevent pressure that compels rapid mechanical results and forbids sufficient concrete number experiences and observations. A finer, more careful consideration of this

year's work will tend to reduce the number of failures in third-year arithmetic, and give a firmer foundation for the work of the following grades.

Outline of Work. 1. Reading and writing of numbers to 10,000. Roman numerals may be written to C. Reading and writing of dollars and cents and of fractions used in this grade.

2. Emphasis upon place value, and upon our notation as a decimal system. Use columns on blackboard, and chalk dots as counters; and columns on paper with charcoal dots as counters. Then use the digits and zero to represent the number indicated by the counters.

DRILL IN NOTATION

1. In *addition* show the real value of each digit or sum of digits; for example,

(a)	(b)	(c)
24	75	75
36	63	63
73	92	92
13	57	57
120	270	287
133	17	
	287	

In (a) the sum of the units is 13. Write 13 as if that were the only sum to be found. The sum of the tens is 12, which means 120. Combine the two sums.

In (b) add the tens first; the sum is 27 tens or 270. Add the units; combine the two sums.

In (c) the sum of the units is 1 ten and 7 units. Place the 1 ten in tens' column and 7 in units' column; then add the tens. Much use of the method in (a) and (b) gives a realization of place value and shows the 2, 3 and 7 in tens' column to be really 20, 30, and 70, giving the sum 120. These several methods make excellent checks in addition. Let the children add using method (a) and check by method (b) or (c); or use (c) first and check by (a) or (b). This gives much opportunity for practice in addition in this and in later grades without direct dependence upon the teacher.

Add the following at sight:

(a)	(b)	(c)	(d)
42	63	82	87
57	24	74	56
99	87	156	143

Seeing 50 + 40 or 90, and 9 in (a)
Seeing 20 + 60 or 80, and 7 in (b)
Seeing 80 + 70 = 150, and 6 in (c)
Seeing 130 + 10 or 140, and 3 in (d)

2. The same idea is emphasized in *multiplication;* for example,

(a)	(b)	(c)
212	212	212
×6	×6	6
12	1200	1272
60	60	
1200	12	
1272	1272	

In (a) we have $6 \times 2 = 12$, $6 \times 10 = 60$, $6 \times 200 = 1200$.

In (b) we begin with the largest number. We begin to multiply at the left or at the right, as we please, and set down the entire product of each multiplication.

In (c) we "carry" the 1 ten, and add it to the 6 tens.

3. In *subtraction* we see it thus:

(1)

$$\begin{array}{r} 86 = 70 + 16 \\ -19 = 10 + \ 9 \\ \hline 60 + \ 7 = 67 \end{array}$$

(2)

$$\begin{array}{r} 284 = 200 + 70 + 14 \\ -157 = 100 + 50 + \ 7 \\ \hline 100 + 20 + \ 7 = 127 \end{array}$$

(3)

$$\begin{array}{r} 836 = 800 + 20 + 16 = 700 + 120 + 16 \\ -249 = 200 + 40 + \ 9 = 200 + \ 40 + \ 9 \\ \hline 500 + \ 80 + \ 7 = 587 \end{array}$$

Let the more concise method follow from this, noting each step, and recognizing the real meaning in the shorter form, as below:

	(4)
836	9 from 16 = 7
−249	4 from 12 = 8
587	2 from 7 = 5

Note that 4 from 12 is 4 tens (or 40) from 12 tens, or 120, leaving 8 tens, or 80; and 2 from 7 is 2 hundred from 7 hundred, or 5 hundred. See how each step in (4) is the same as the corresponding step in (3).

4. In *division* the appreciation of the real value of each digit, due to the place it occupies, removes many of the difficulties attendant upon this process. It is shown below:

(1)

$342 \div 3 = n$

$3\overline{)342} = 300+30+12$

$100+10+4 = 114$

(2)

$588 \div 4 = n$

$4\overline{)568} = 400+160+8$

$100+40+2 = 142$

3. *Processes.* (a) Rapid and correct adding and subtracting of easy numbers.

(b) Tables through the 12's. Counting forward and backward by 2's, 3's, 4's and 5's.

(c) Multiplication and division. Multiplier and divisor to be 10 or less. Written seat work emphasized. Comparison of quantities continued.

their gain if they sold it at 4 cents a pint glass?

Helps on the Outline. *Various Suggestions.* (a) In this grade especial attention should be given to neatness and accuracy in written work, as well as to the more exact oral expression of number facts. Make a point of praising attempts to shape figures well and to give results rapidly and accurately.

(b) There is great delight at this age in "numbers." Make much use of number games in fixing number facts, especially the tables.

As suggested later, great enthusiasm may be maintained, and drudgery forgotten, if the teacher will enter, with the spirit of fun, into the work on tables, as games in which all may compete. However, before rapidity

ADDITION, SUBTRACTION AND MULTIPLICATION WHEELS

4. *Fractions.* Halves, fourths, eighths, thirds and sixths.

5. *Denominate Numbers.* Emphasize and continue denominate numbers as presented in grades one and two. Change denominate numbers to the next larger or smaller unit. Tell time by the clock to minutes.

6. *Measuring.* Make still further use of measuring of all kinds.

7. *Problems.* Let the problems be vital to the children, interesting and full of meaning for them.

Real problems in comparison arise, as:

If 3 sheets of cardboard cost 5 cents, what is the cost of 6 sheets? Let the comparison of 6 with 3 precede the second step of the problem.

Jim and Harold kept a lemonade stand at a picnic. At 5 cents a quart, what did it cost to make 2 gallons of lemonade? What was

or fluency in them is demanded, the number facts must be well taught.

(c) Make use of the wheels given above. Encourage original "number pictures" made by the pupils to illustrate problems.

(d) Make use of many problems. The following are suggested as typical of such as may be employed:

1. We have been in school, now, 1½ hours. How many minutes is that?

2. Fred is exactly 4 feet high. How many yards high is he?

3. A piece of paper is 12 inches long and four inches wide. Into how many smaller pieces two inches long and two inches wide can you cut it?

4. You take to the store 30 eggs, which the merchant buys at 12 cents per dozen. You buy one-quarter pound of tea at 40 cents per pound and a package of starch for 10 cents. How much money does the merchant then owe you?

5. If a domino is 2 inches long, how many placed in a row will reach one yard?

6. If Willie can walk one mile from his home to his uncle's house in 30 minutes, how long will it take to walk to town, which is one and one-half miles farther than his uncle's?

7. Subtract the following columns of figures at sight:

9	7	11	12	13	14	13	14
2	3	2	3	2	2	3	3
6	9	11	12	11	13	12	14
4	4	4	4	3	4	3	4
8	7	9	10	12	9	11	8
5	5	5	6	5	6	6	6

(e) Always follow this plan in measuring: (1) Let pupils estimate the distance or the quantity. (2) Measure, exactly. (3) Compare the measure with the estimate of it.

Special Inexpensive Devices. Some of the devices which are particularly appropriate for third-grade pupils follow:

"Table" Wheel. Make a large copy of the "Number Wheel" on the board.

TABLE WHEEL

This is one of the most interesting devices for training in number facts. It may be used in varied ways, as follows:

1. The teacher, using the pointer, says, "Give table of sixes, rapidly."

2. A pupil uses the pointer and chooses other pupils to answer.

3. Sides are chosen. The teacher, rapidly pointing, gives each side a turn in succession. One child may keep tally.

4. The central figure may be changed and the sign + placed on the board. Then tests may be given for correctness and rapidity. The pupils may write the results and rise when the work is finished.

Chart of Comparisons. An ingenious teacher will find such a diagram full of possibilities for training the eye to see, the mind to judge, etc. Comparisons are easily taught by its use. She may ask such questions, at last, as the following:

Which line is twice B? Which two added make H? Which line is the difference between F and D? Call A 5; name the others. Call A 6, and name the others.

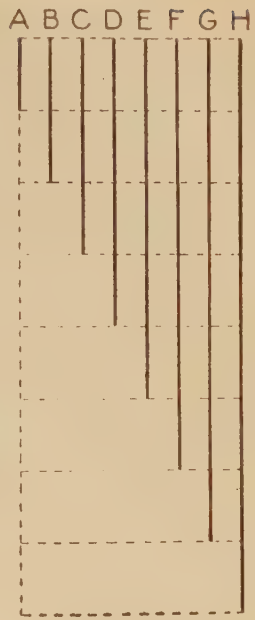
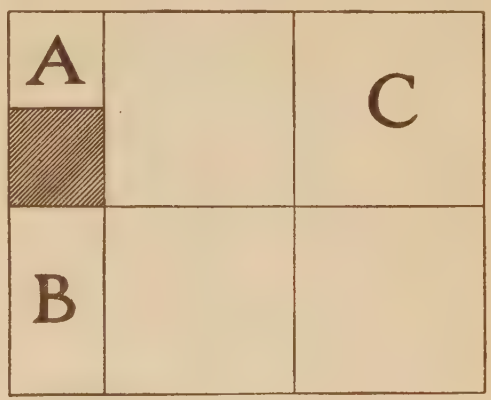


CHART OF COMPARISONS

Fraction Chart. The teacher or parent may make a large drawing of the accompanying fraction chart, about 2½ feet by 2 feet in size, and may direct the children to reproduce it on paper reduced to a size of 2½ inches by 2 inches. This small chart may then be used for illustrating problems involving fractions and proportionate dimensions.



FRACTION CHART

Such questions as the following will be of special value here, and each is applied to the small drawing in the hands of the pupils:

How many square inches in the entire figure?

How many square inches in C?
What part of a square inch is B?
How large is A when compared to C?
How large is B when compared to A?
Into how many quarter-inch squares could you divide the whole figure?

With the use of squared paper many comparison charts may be made.

Primary Combinations of Numbers. We give you herewith every combination in the

1	1	1	1	1	1	1	1	1
1	2	3	4	5	6	7	8	9
2	2	2	2	2	2	2	2	
2	3	4	5	6	7	8	9	
3	3	3	3	3	3	3		
3	4	5	6	7	8	9		
4	4	4	4	4	4			
4	5	6	7	8	9			
5	5	5	5	5				
5	6	7	8	9				
6	6	6	6					
6	7	8	9					
7	7	7						
7	8	9						
8	8							
8	9							
9								
9								

addition table up to 10. This table is known as the list of forty-five combinations of numbers. It will be noticed that combinations of 1 with all digits are represented in the first line, that there will be one less combination for the 2's, 2+1 being represented in the first line, and for this reason each succeeding table would necessitate one less combination, until in the table of 9's, only 9+9 would not have been learned in a previous table. Use this table for testing, or for home-work for backward pupils.

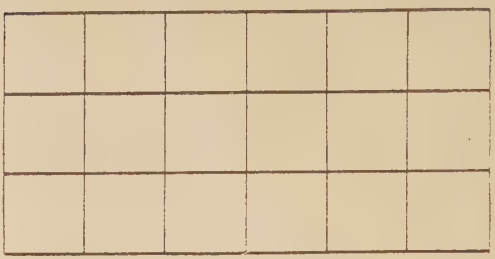
Oral drill from this table, arranged in chart form or placed upon a blackboard, must be continued until the pupils are thoroughly familiar with these facts.

It is hardly necessary for us to suggest that the pupil and teacher prepare similar exercises for subtraction, multiplication and division.

By placing any figure desired before those given, a great many pure number problems may be easily contrived by teacher or mother.

Games. As in the second year, games are a "first aid" in number work.

Factor Game: Factor a number on squared paper thus:



FACTOR GAME

$18 = 3 \times 6$
18 = 3 6's

FACTOR GAME

$18 = 6 \times 3$
18 = 6 3's

Children may show papers to each other and see who can tell what factors are shown by the drawing. This may be carried on also with inch-cubes or with pennies.

Game of Multiples. Place 20 multiples on the board, as 36, 45, 16, 28, etc. Give 1 minute to factor; the child who factors the greatest number correctly in the time wins; or, write on the board as many columns of 20 multiples each (the same multiples in each column but in varying order) as there are rows in the class. When the teacher says, "Go," the leader of each row runs to the board and factors the first number, then the row follows in order. The row that finishes first with fewest errors, wins.

Circle of Multiples. (a) Figure is shown herewith. In outer spaces place multiples; in middle corresponding spaces place one factor of the multiples; place *n* in the inner circle. Child goes to board and points to a member in outside row, another child runs to the board, erases *n* and places other factor in inner circle. The row making fewest errors wins. The multiples are changed by

the teacher during game after they have been used once or twice.

(b) This game may be varied by filling the inner circle with a factor, for example 8, and the outer circle with multiples of 8; then

CIRCLE OF MULTIPLES

the game is to fill the middle ring of spaces with the missing factor.

Suggestive Home Problems. *Third Grade.* The following are suggested as excellent for this year:

1. How much do pork chops cost a pound? How many chops do you usually get in a pound? About how much does each pork chop cost?

2. How long is your house? How wide? Measure from the outside.

3. Find the cost of the eggs that your mother uses in one week.

4. How many level teaspoons of water are equal to a tablespoonful? How many tablespoonfuls in a cup?

5. What newspapers do your family get? Find cost for one day for each member of the family. For one week.

6. Make out a bill for the groceries and meat you have bought to-day.

Fourth Year

General Suggestions. The fourth year finds the child (1) generally familiar with the meaning of the fundamental processes and the technique of the processes with small numbers, and he is now prepared to follow up this control in similar work with larger numbers; and (2) his broader social interests are carrying him into conditions that furnish varied material for number problems. He finds problems in shopping for his mother, in purchasing school supplies, in saving money, in spending for Christmas, in buying balls, bats, marbles, etc.; in various household expenses, in gardening, in building wagons, in games of racing, jumping, etc. These new interests make it possible to emphasize number facts already met by repeating them in new concrete situations.

Outline of Work. 1. Reading and writing of numbers to one million; Roman numerals to M; dollars and cents.

2. *Processes.* (a) Work for greater familiarity with number facts of addition, multiplication, etc.; for greater accuracy and speed in the four operations.

(b) Use multipliers of two and three digits; long division; division of two digits; comparisons or ratio idea continued and extended.

(c) Reduction, comparison, addition and subtraction of simple fractions to twelfths, as oral work.

3. *Denominate numbers.* Review of tables used in previous grades. Emphasis upon units of square measure, and upon measuring surfaces. Introduction of simple cubic measure—cubic weight and cubic foot. Avoirdupois table and its use.

Helps on the Outline. 1. Write on the blackboard, or on paper or cardboard charts that are ready for use at any moment, columns of figures that will serve the purpose of emphasizing the 9's, 8's, 7's, or any multiplication or division facts, as follows:

1. (a)		(b)		
27		14		Divide, disregarding the remainder. This gives excellent opportunity to repeat the same fact; for example, in (a) the child thinks $3 \times 9 = 27$ in each of the first three divisions; in the next four divisions he thinks of the fact, $4 \times 9 = 36$. In this way he repeats a number fact many times, but each time he has a new element in the situation. He enjoys being allowed to neglect the remainder; the work moves more rapidly with this omission,
29		17		
32		21		
36		20		
40		23		
39		35		
41		33		
45		39		
18		38		
16	$\div 9$	42	$\div 7$	
20		56		
54		54		
52		60		
57		63		
72		64		
68		28		
75		25		
63		65		
81		46		
82		42		

while the desired facts are established as effectively as if the remainder were required.

2. Another aid in reviewing tables follows. Reduce the following to whole or mixed numbers:

$\frac{5}{2}\ \frac{7}{3}\ \frac{9}{4}\ \frac{10}{4}\ \frac{11}{4}\ \frac{19}{6}\ \frac{20}{6}\ \frac{23}{6}\ \frac{21}{7}\ \frac{23}{7}\ \frac{25}{7}\ \frac{18}{9}\ \frac{20}{9}$, etc.

3. A help toward ease in "carrying" in multiplication.

$6 \times 3 = 18$
$6 \times 5 + 1 = 31$
$6 \times 6 + 3 = 39$
$6 \times 7 + 3 = 45$
$6 \times 9 + 4 = 58$
$6 \times 2 + 5 = 17$
$6 \times 1 + 1 = 7$
$6 \times 4 = 24$
$6 \times 8 + 2 = 50$

Repeat the table, "carrying" the tens of the last product and adding it to the new product. This gives much practice in carrying and adding which the usual repetition of the "tables" does not provide. Observation has shown that a very large part of the errors in multiplication is due to lack of facility in carrying and adding rather than to lack of knowledge of multiplication facts; so this drill is valuable.

4. Find the largest common factor in 18, 27, 45; in 21, 35; in 63, 45, 72; in 16, 20, 12; in 24, 64, 56; in 30, 70, 80, and so on.

5. How many yards in 15 feet, 20 feet, 24 feet, etc.? How many feet in 24 inches, 36 inches, 60 inches, 30 inches, 54 inches, etc.? The above are all practical helps in making the child familiar with multiplication facts, and therefore aid in division also.

6. The following exercise helps to clever handling of simple multiplication without pencil; develops concentration and emphasizes the meaning of units and tens, and place value: $6 \times 32 = 180 + 12 = 192$; $7 \times 23 = 140 + 21 = 161$; $9 \times 54 = 450 + 36 = 486$, and so on.

7. $8 \times n = 56$
$n \times 9 = 72$
$7 \times 6 = n$
$12 \times n = 108$
$n \times 6 = 54$
$6 \times 3 = n$

The children and the teacher place such facts upon the board, n standing for the number which the class must substitute. The child who knows, runs to the board, erases n and places the correct number in its place. The exercise may be varied by (1) rewriting the whole expression just under the one given and putting the number in instead of n, as follows: $8 \times n = 56$, $8 \times 7 = 56$, or (2) writing "$n = 7$" immediately under the given part; as follows: $8 \times n = 56$, $n = 7$.

8. To clarify multiplication and division continue to emphasize place value.

(a)	(b)	(c)
352	352	352
×26	×26	26
12= 6× 2	6000=20×300	2112
300= 6× 50	1000=20× 50	704
1800= 6×300	40=20× 2	9152
40=20× 2	1800= 6×300	
1000=20× 50	300= 6× 50	
6000=20×300	12= 6× 2	
9152	9152	

Find the first 3 products of (b) in (c). Find the last 3 products of (b) in (c).

(d)	(e)
352	352
26	26
2112	1800= 6×300
	300= 6× 50
	12= 6× 2
	6000=20×300
704	1000=20× 50
9152	40=20× 2
	9152

The above is suggestive of what should be seen and understood in this work.

9. Aid to division. $72 \div 8 = n$. Read, "How many 8's in 72?" The expression "divided by" is a technical expression which does not emphasize the number idea involved. So in the early days of division the question given above is more helpful in keeping the real number situation clear to the child. As suggested earlier in this work, the technical signs and expressions must come in gradually, and must be interpreted through the more familiar non-technical expression of the same thought.

10. Show the meaning of the process of division; as follows:

(a)

$1344 \div 42 = n$

$30+1+1=32$

$40+2 \overline{)1344=1200+100+40+4}$

$1200 \quad 60$

$40+40+4$

$40 \quad +2$

$40+2$

$40+2$

(b)

$30+2=32$

$40+2 \overline{)1344}$

$1200=30\times40$

144

$60=30\times2$

84

$80=2\times40$

4

$4=2\times2$

(c)

$7866 \div 23 = n$

$$
\begin{array}{r|l}
20+3 & 300+40+2=342 \\
\hline
7866=6000+1800+60+6 & \\
6000+\ 900 & \\
\hline
900 & \\
60 & \\
\hline
960=800+160 & \\
800+120 & \\
\hline
40+6 & \\
40+6 & \\
\hline
\end{array}
$$

(d)

$$
\begin{array}{r|l}
20+3 & 300+40+2=342 \\
\hline
7866 & \\
6000=300\times 20 & \\
\hline
1866 & \\
900=300\times 3 & \\
\hline
966 & \\
800=40\ \times 20 & \\
\hline
166 & \\
120=40\ \times 3 & \\
\hline
46 & \\
46=2\ \ \times 23 & \\
\hline
\end{array}
$$

11. The dividend is a quantity to be measured; the divisor is the measuring unit, and the quotient (how many?) tells how many of the measuring units are in the dividend, or quantity measured. A furniture merchant wishes to purchase beds at an average cost of $42 apiece. He has $1,344. This sum of money must be measured by the unit of measure, which is the cost of 1 bed; that is, $42. When he has measured by dividing he finds that $1,344 contains $42, 32 times, and so will buy 32 beds.

12. The child must see that the "bringing down" in division is subtraction. This is shown clearly in process (b) and (d) above in point 10.

13. See the meaning of the remainder in division. Sarah has 75 cents; she buys hair ribbon at 20 cents a yard. How many yards can she buy? She can buy 3 yards, and will have 15 cents left. If she wishes to spend this she can buy $\frac{3}{4}$ of a yard, or spending all her money, she can buy $3\frac{3}{4}$ yards. In division it appears thus:

$$
\begin{array}{r|l}
20 & 3\frac{3}{4} \\
\hline
75 & \\
60 & \\
\hline
15 &
\end{array}
$$

14. *Aids in Measures.* (a) Mark off square foot and square yard on blackboard and on floor; repeat the measure, marking off groups of each unit of measure. (b) Estimate areas; then test the estimate by measuring. (c) Have inch cubes; make a cubic foot out of strong paper on cardboard; see what it will hold; use it as a measure of space in the room.

15. *Aids in Fractions.*

(1) Show $\frac{3}{4}$ of a pound of butter (Fig. a).
(2) $\frac{3}{4}$ of a dozen eggs (Fig. b).
(3) $\frac{3}{4}$ of a yard of ribbon (Fig. c).
(4) $\frac{3}{4}$ of 36 inches (Fig. d).
(5) $\frac{3}{4}$ of 100 square yards (Fig. e).

Fractions. Use of simple familiar fractions without a definite formulation or study of the subject of fractions.

Fig. a.

Fig. b.

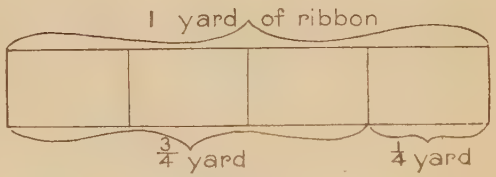


Fig. c.

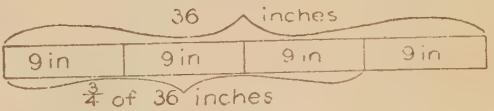


Fig. d.

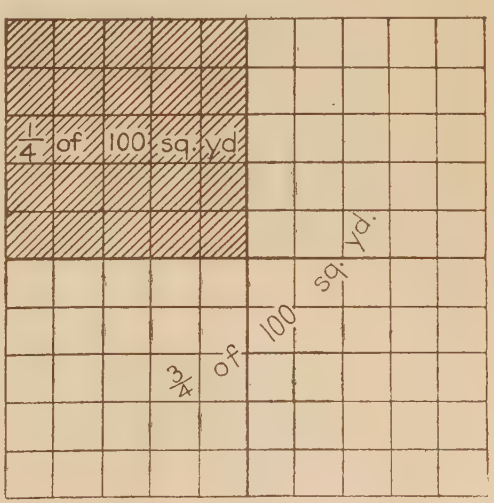


Fig. e.

(a) In the work in measures, as

30 inches = 2 ft. 6 in. or $2\frac{1}{2}$ ft.
7 feet = 2 yd. 1 ft. or $2\frac{1}{3}$ yd.
5 pints = $2\frac{1}{2}$ qt.
8 ounces = $\frac{1}{2}$ lb.
9 ounces = $\frac{3}{4}$ lb.

(b) In comparison or ratio, as 4 lb. of candy is $\frac{1}{2}$ as much as 8 lb., and so costs $\frac{1}{2}$ as much; 9 eggs are $\frac{3}{4}$ of a dozen; if eggs are 40 cents a dozen, 9 eggs cost $\frac{3}{4}$ of 40 cents or 30 cents.

(c) In prices, as, What will 2 lb. of cheese cost at $17\frac{1}{2}$ cents per lb.?

Cost of 4 yds. of narrow red, white and blue ribbon at $12\frac{1}{2}$ cents a yard?

Cost of $2\frac{3}{4}$ tons of coal at $12 per ton?

HELP IN TEACHING RATIO

(d) Fraction of a dozen is common in buying bakery goods, fruit, eggs, etc.

Adaptability of Outlines. The outlines presented in the foregoing pages are not offered with the expectation that they shall be applied in every school or home always in the exact way suggested. What is best for pupils in a given grade in one locality may be better for the grade higher or the grade lower in a different locality, or where students work under different conditions. Topics set down for the work of one grade may be begun one grade earlier and continued into the succeeding one, or, as in case of such topics as fractions, mensuration, etc., may be used in all grades. Where textbooks are used by regular adoption the suggestions in the outlines may be advantageously used to supplement the books. Parents of children who need special aid in mathematics will find the outlines we offer will be very acceptable and practical helps.

Sources of Problems. Most of the problems in this grade are from the following sources:

(a) Problems arise in work and play in school.

(b) At home, shopping, cost of clothes, shoes, etc., transportation expenses, rent, coal, light, milk bills, amusement, wages.

(c) Problems arise in shop, store, farm, on the street.

(d) In city and national affairs familiar to the children.

Suggestive Problems. The following are of a class of problems which are applicable to this grade:

1. On Jane's paper 20 words were spelled correctly. There were 25 words written. What part of the lesson was correct? Do you think this a good lesson?

2. James' jump measures 4 ft. 6 in.; Arthur's measures 5 ft. 4 in. How much farther does Arthur jump than James?

3. A robin ate 65 cut worms a day. In 24 days how many did he eat?

4. A robin ate 36 locusts a day; how many did 12 robins eat in 20 days?

5. Make a bill for at least 5 articles bought at the grocery and meat market yesterday. Receipt the bill.

6. Get data for money needs of various city departments, as schools, police, public works, etc. How much needed in all?

ROBIN PROBLEMS

7. How many acres in the school yard?

8. A class of 24 children plan a picnic luncheon; the luncheon costs $3.84. How much must each child pay as his share?

9. A fourth-grade class of 42 children gave $9.24 to the Red Cross. What was each child's share of the donation?

10. If milk were to fall $1\frac{1}{2}$ cents a quart, what change would that make in your milk bill in a month?

11. How many persons can be seated in one of the street cars with which you are familiar?

12. You gave a dollar bill to the druggist when you made a 12-cent purchase. Tell several different forms in which you might have been given the change.

13. Find the cost of 4 Victrola records; one, $3.00; 2, each $.75, and the other, $1.25.

14. What is the cost of a dining-room set; table, $49.50; 5 chairs at $4.25 each; an arm-chair $7.50, and a side table $38?

Home Problems. The following are effective for the fourth grade:

1. Make a list of the things your mother sends you to the store for every day this week and the cost of each. Thursday night find out how much you spend for the four days and bring your work to school Friday. (Given on Monday.)

2. What is the amount of your last gas bill? If your mother has it, find the amount of your bill for last August. What is the difference between the two? (If children come from homes lighted by gas.)

3. Keep track of the number of pounds of meat your mother gets every day this week. Find number of pounds used in the entire week.

4. Make a bill like the following and find total amount spent:

2 lb. butter at
10 lb. rice at
3 lb. bacon at
1 lb. cheese at

Use prices your mother pays.

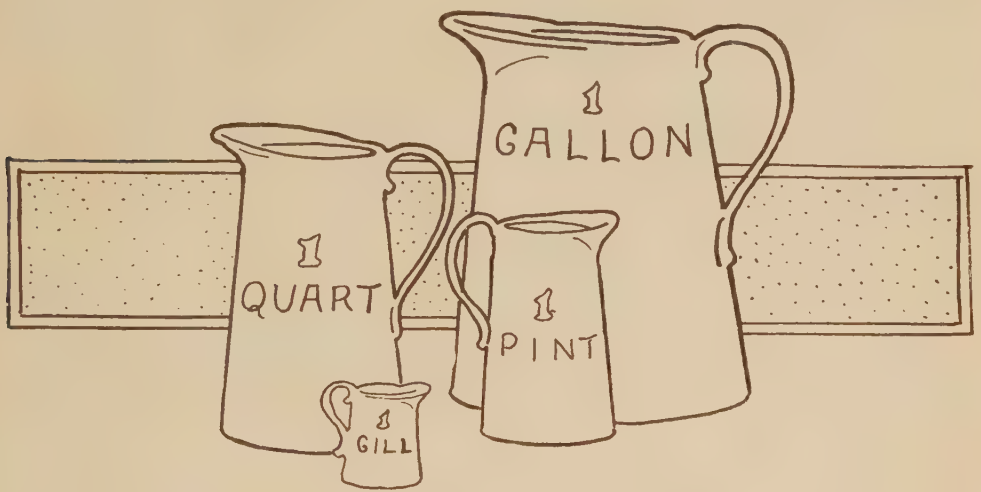
5. How much does the milk for your family for one day cost? How much do you use in a week? How much does it cost?

6. How wide and how long is the lot your house is on? How many square feet in the lot?

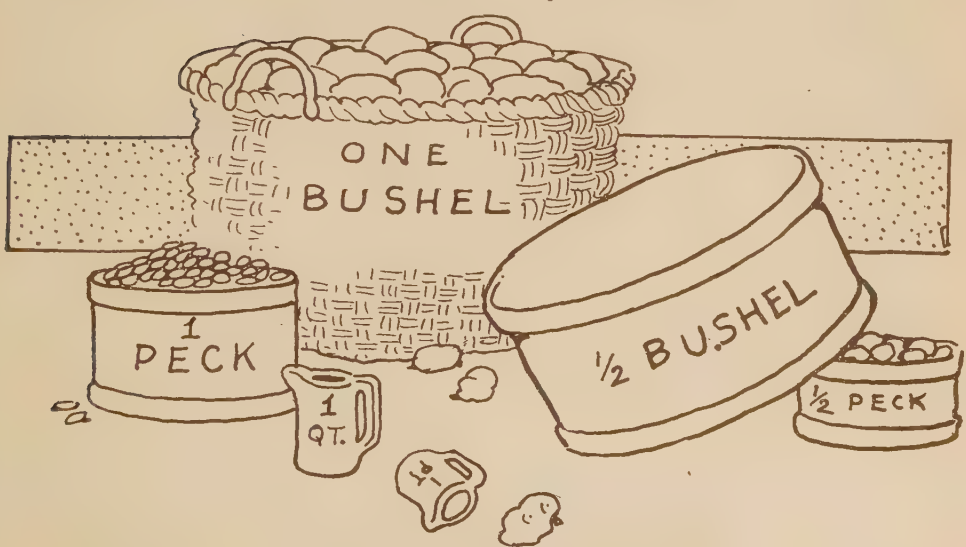
which one is teaching and the work following it are of vital importance to one; the work overlaps, and the same suggestions fit into various years, with little or much variation. Look forward also for work in fractions that will throw light upon the introduction of that work in Fourth Year.

Fifth Year

General Suggestions. The mathematical work of the preceding years leaves the child



HELPS IN TEACHING LIQUID MEASURE



HELPS IN TEACHING DRY MEASURE

Refer to 5th-year work and note section on "Good mathematical expression." It is good to read the suggestions for the several years, for the work previous to the year

familiar with the four fundamental processes in whole numbers. He adds and subtracts with understanding and ease small and relatively large numbers; he has at command

all multiplication facts necessary for any problem in multiplication, and is ready to carry on that process at any length, needing no new facts, but gaining power and ease in the use of the facts that are already his own. He is at home in simple division, short and long. Here again he has the facts, and understands the meaning of the process. But in the particular process of long division he needs further help as to a clear understanding of it.

He has, in addition to his control of whole numbers, an easy use of small fractions. He is ready for a study of fractions, which is the big piece of work for this grade. Here the child formulates fractions, makes a definite study of them, and comes into control of them as he has of whole numbers in the first four years.

Outline of Work. 1. *Varied Processes.* Oral and written review and practice in the four fundamental operations: addition, subtraction, multiplication and division. How to read and write nine-digit whole numbers; how to interpret numbers in Roman numerals. Simple factoring by sight. Ratio comparison of numbers continued.

2. *Common Fractions.* Addition, subtraction, multiplication and division of common fractions with *small* fractional numbers.

Intelligent use of cancellation in the multiplying and reducing of fractions.

3. *Denominate Numbers.* Application of measures of length, surface, volume, time, capacity and weight.

4. *Mensuration.* Areas and perimeters of rectangles; surface and volume of right prisms.

5. *Problems.* Many real problems using the processes emphasized under the fundamental operations, fractions and work in denominate numbers. Problems in which the pupils state merely how the problems may be solved; others in which they think problems through and give approximate answers before solving. How to make, foot and balance simple bills.

Helps on Outline. The advance work of the year is fractions. The study of fractions presents an excellent opportunity to emphasize the meaning of number, especially for the benefit of the mind that has not grasped this in the whole number work; that has come up to the fifth grade much "in the dark." Here the teacher finds her great opportunity to "begin all over;" that is, to have the child meet again the very simplest number ideas, in an appreciation of fractions. Many suggestions as to how to help the child reach this appreciation are given here.

(a) *Units of Measure.* Use definite units of measure—yard, foot, etc.; square yard, square foot, etc.; pound, ounce, etc.; pint, quart, etc.; peck, bushel, etc. A pie, an orange, an apple are not mathematical units. Through use of them as such, the mind fails to get the number idea. A foot is $\frac{1}{3}$ of a yard. Measure the length of the blackboard with a foot rule.

Teacher—"How long is the blackboard?"
Child—"Six feet."
Teacher—"Tell the length in another way."
Child—"Six-thirds of a yard."

The teacher writes on the board, $\frac{6}{3}$ of a yard.

Measure many distances in this way, and write $\frac{7}{3}$ yard, $\frac{8}{3}$ yard, $\frac{19}{3}$ yard, and so on. Here is appreciated clearly the measuring unit as $\frac{1}{3}$ of a yard, and the 72 or 19 as the number of units of measure in each distance measured; also the yard as the standard unit from which the $\frac{1}{3}$ yard comes.

Have on hand a dollar, half-dollars, quarters. The child sees that something costs 3 quarters or 3 half-dollars, or $\frac{3}{4}$ of a dollar, or $\frac{3}{2}$ of a dollar. Again he sees $\$\frac{1}{4}$ or $\$\frac{1}{2}$ as the measuring unit, the numerator showing the number of the measuring units in the money spent, and the dollar as the standard unit from which the unit of measure comes. In using the ounce as a unit of measure, he weighs 5 ounces of candy or butter, and sees it to be $\frac{5}{16}$ of a pound. He uses $\frac{1}{16}$ lb., $\frac{1}{3}$ yd., $\$\frac{1}{4}$, $\$\frac{1}{2}$ and so forth, as units of measure with which to measure (or weigh) some quantity which he wishes to know definitely, and then counts to know how many of these units of measure there are in the quantity. Finally he says, "This quantity is $\frac{5}{16}$ of a pound; this one is $\frac{3}{4}$ of a dollar; this one is $\frac{7}{3}$ of a yard." Here he has a right idea of number, and a clear idea of a fraction. Fractions must not be regarded as different from number; indeed, in the fraction we find expressed the complete development of the number idea—the unit of measure, the measuring and the counting.

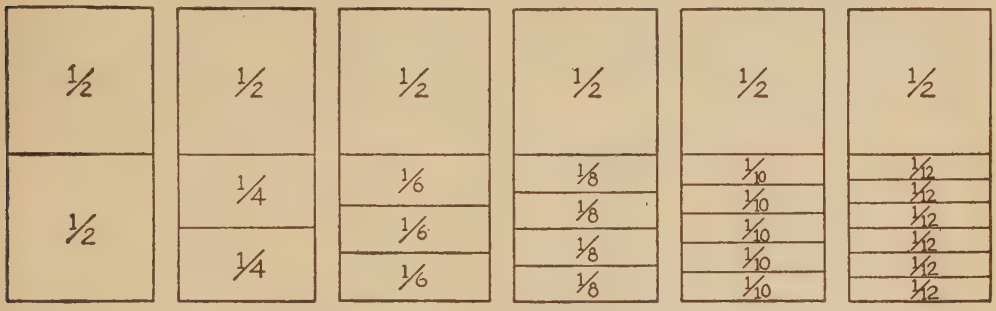
(b) *Ratio Idea.* Working as above indicated, the child sees 1 ft. as $\frac{1}{3}$ yd.; 2 ft. as $\frac{2}{3}$ yd.; 1 oz. as $\frac{1}{16}$ lb.; 5 oz. as $\frac{5}{16}$ lb.; 7 oz.

as $\frac{7}{16}$ lb.; 3 pk. as $\frac{3}{4}$ bu. and so on; he is getting the ratio idea in the ideal way.

(c) *Reduction.* He comes to see that 8 oz.=$\frac{1}{2}$ lb.; \$$\frac{2}{4}$=\$$\frac{1}{2}$; $\frac{8}{12}$ ft.=$\frac{1}{4}$ ft.; $\frac{2}{4}$ bu.=$\frac{1}{2}$ bu.; that is, he changes his unit of measure by grouping; he sees that 2 eight oz.=1 lb., or $\frac{8}{16}$ lb.=$\frac{1}{2}$ lb. He sees 4 three inches as 1 ft., or $\frac{3}{12}$ ft.=$\frac{1}{4}$ ft. It is in this way that he realizes that he changes his unit of measure for convenience of thinking or telling, and that accordingly he changes the number of parts in the measured quantity. This is the method of approach to what is called "reduction of fractions to higher or lower terms." In this the teacher sees an ideal opportunity to get to review whole number facts. To sum up this in definite form, we say: "We may multiply or divide both terms of a fraction by the same number, and the value remains the same." For example,

$$\frac{4}{8}\text{ft.}\ \begin{matrix}\div 4\\ \div 4\end{matrix} = \frac{1}{2}\text{ft.};\quad \frac{9\text{ lb.}}{12}\ \begin{matrix}\div 3\\ \div 3\end{matrix} = \frac{3}{4}\text{lb.};\quad \text{\$}\frac{6}{4}\ \begin{matrix}\div 2\\ \div 2\end{matrix} = \text{\$}\frac{3}{2};$$

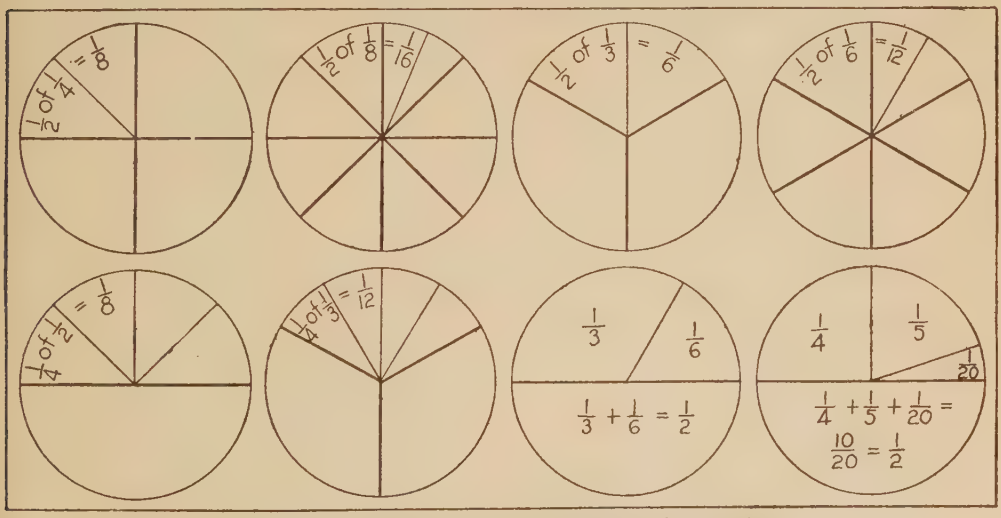
$$\frac{27}{36}\text{yd.}\ \begin{matrix}\div 9\\ \div 9\end{matrix} = \frac{3}{4}\text{yd.};\quad \frac{5}{6}\text{ft.}\ \begin{matrix}\times 2\\ \times 2\end{matrix}\ \frac{10}{12}\text{ft.};\quad \frac{3}{4}\text{lb.}\ \begin{matrix}\times 4\\ \times 4\end{matrix}\ = \frac{12}{16}\text{lb.}$$



FOR COMPARISON OF FRACTION VALUES

This formal statement and illustration should follow much concreteness, seeing and handling.

(d) *The Unit of Measure in Addition and Subtraction.* The child has no new point to learn in adding or subtracting. He adds $\frac{1}{8}$ pk. and $\frac{3}{8}$ pk. and $\frac{2}{8}$ pk. and has $\frac{6}{8}$ pk.; he combines \$$\frac{1}{4}$ and \$$\frac{2}{4}$ and \$$\frac{3}{4}$ and finds he has \$$\frac{6}{4}$. He combines with reference to his unit of measure $\frac{1}{8}$ pk., \$$\frac{1}{4}$, just as he does in whole numbers with reference to 1 pk. or \$1. He sees that if his fractions have not the same unit of measure that to combine them he must change them to the



CIRCLES ILLUSTRATING FRACTION VALUES

same unit measure, as $\$\frac{1}{4}+\$\frac{1}{2}=\$\frac{1}{4}+\$\ =\$\frac{3}{4}$; $\frac{5}{6}$ ft.$+\frac{3}{4}$ ft.$=1\frac{0}{12}$ ft.$+\frac{9}{12}$ ft.$=1\frac{9}{12}$ ft. This sum he may leave in this form or he may change it to 1 ft.$+\frac{7}{12}$ft. or $1\frac{7}{12}$ft.; $\frac{1}{36}$ yd.$-\frac{1}{8}$ yd.$=\frac{1}{36}$ yd.$-\frac{12}{36}$ yd.$=\frac{5}{36}$ yd. As an intermediate step between the concrete and the abstract in reduction, the squared paper may be used, as in the following figure (Fig. 1). See $\frac{3}{24}=\frac{1}{8}, \frac{9}{24}=\frac{3}{8}, \frac{18}{24}=\frac{3}{4}$, etc. The rectangles can be referred to by number or letter; for example, □'s 1+9+17=($\frac{3}{24}$ or $\frac{1}{8}$) of ABCD. ATSD=($\frac{9}{24}$ or $\frac{3}{8}$) of ABCD.

This method is rarely presented, but one finds it a very concise, rapid method. It is good to let the children use one method as a check upon the other. The usual method will present this problem in this way:

$$\begin{array}{r} 18\frac{1}{4}=17\frac{5}{4}=17\frac{1}{12} \\ 11\frac{3}{3}=11\frac{8}{8}=11\frac{8}{12} \\ \hline 6\frac{7}{12} \end{array}$$

(e) *Multiplication of Fractions.* The child who sees the measuring unit in each fraction and understands the numerator as

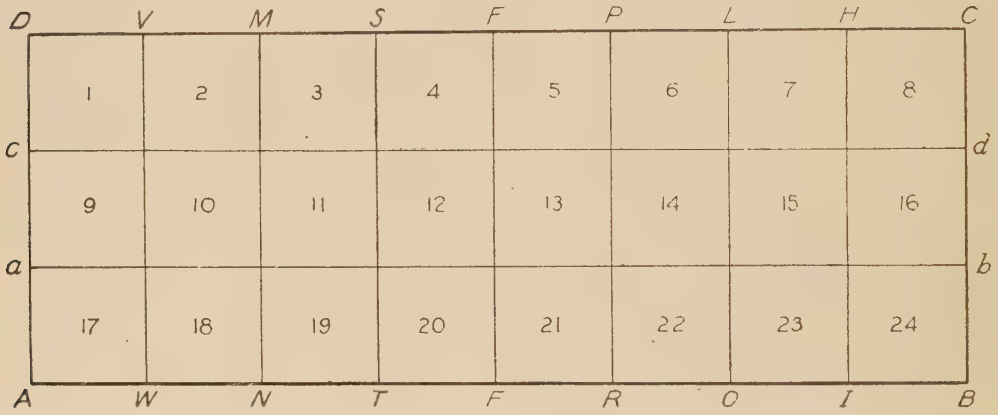


Fig. 1

Clear expression of technique is an aid to clear thinking.

$$\begin{array}{r} 8\frac{2}{3}\text{ oz.}-5\frac{3}{4}\text{ oz.}=n. \\ 8\frac{2}{3}=8\frac{8}{12}=7\frac{20}{12} \\ 5\frac{3}{4}=5\frac{9}{12}=5\frac{9}{12} \\ \hline 2\frac{11}{12} \\ 16\frac{2}{5}+\ 9\frac{3}{4}\ +12\frac{11}{20}=n. \\ 16\frac{2}{5}\ =16\frac{8}{20} \\ 9\frac{3}{4}\ =\ 9\frac{15}{20} \\ 12\frac{11}{20}=12\frac{11}{20} \\ \hline 37\frac{34}{20}=38\frac{14}{20}=38\frac{7}{10} \end{array}$$

A suggestion for an interesting method of subtraction is given here:

$$\begin{array}{r} 18\frac{1}{4}-11\frac{2}{3}=n. \\ 11\frac{2}{3} \\ \hline 6\frac{1}{3}+\frac{1}{4}=6\frac{7}{12} \end{array}$$

11 from 17 (you know $\frac{2}{3}$ is larger than $\frac{1}{4}$, and so you must take one from 18) leaves 6. Take $\frac{2}{3}$ from the one you took from 17; this leaves $\frac{1}{3}$; now add the $\frac{1}{4}$ left above.

Set forth in full, it is this:

$$\begin{array}{r} 18\frac{1}{4}=17+1+\frac{1}{4} \\ 11\frac{2}{3}=11+\frac{2}{3} \\ \hline 6+\frac{1}{3}+\frac{1}{4}=6\frac{7}{12} \end{array}$$

expressing the number of measuring units in the quantity will have no difficulty in finding a fractional part of a fraction; as,

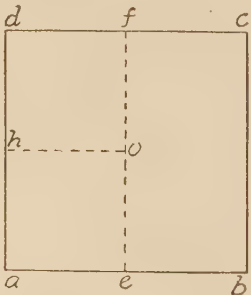


Fig. 2

$\frac{1}{2}$ of $\frac{1\text{ lb.}}{2}$; $\frac{1}{3}$ of $\frac{3}{8}$ pk., and so on.

AEFD=$\frac{1}{2}$ of ABCD
HOFD=$\frac{1}{2}$ of AEDF
HOFD=$\frac{1}{4}$ of ABCD

Rectangle AKHD=$\frac{1}{3}$ of ABCD (Fig. 3)

Rectangle XVI=$\frac{1}{4}$ of $\frac{1}{3}$ of ABCD

XVI+XVII+XVIII=$\frac{3}{4}$ of $\frac{1}{3}$ of ABCD

The figure shows these three to be $\frac{3}{20}$ of ADCD, and so shows $\frac{3}{4}$ of $\frac{1}{3}=\frac{3}{20}$. Many similar facts can be ingeniously shown by this figure.

Here (Fig. 4) we see $\frac{1}{2}$ of $\frac{3}{4}$ lb. of candy=$\frac{3}{8}$ lb. candy. Use inch, cubes and pennies to show such relations. Let a child have 20 pennies for his money. Let him show $\frac{1}{2}$ of $\frac{1}{2}$ of his money, $\frac{1}{2}$ of $\frac{1}{5}$ of his money, $\frac{1}{5}$ of $\frac{1}{2}$ of his money; $\frac{2}{5}$ of $\frac{1}{2}$ of his money, etc.

Some suggestions as to multiplication of mixed numbers:

(1) $6\frac{4}{5}\times 20=n$. $\quad 20\times 6=120$, $\quad 20\times\frac{4}{5}=16$

$$\begin{array}{r} {\scriptstyle 20}\\ 120\\ {\scriptstyle 16}\\ 136 \end{array}$$

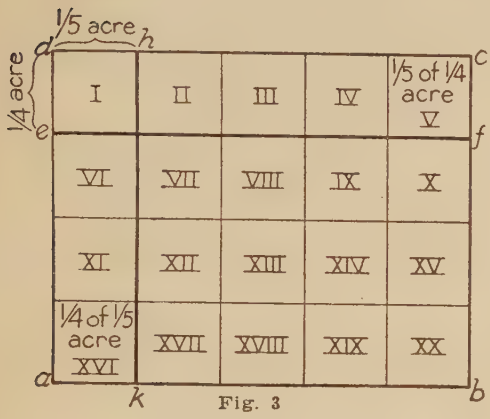


Fig. 3

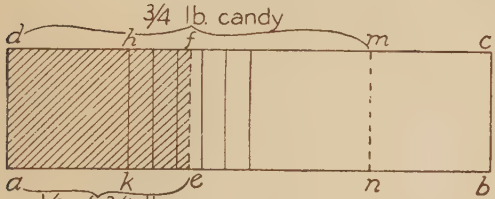


Fig. 4

(2) $18\times 9\frac{2}{3}=9\times 18+\frac{2}{3}$ of $18=162+12=174$, or

(3)
$$\begin{array}{r} 18\\ 9\frac{2}{3}\\ \hline 162\\ 12\\ \hline 174 \end{array}$$

(4) $8\frac{2}{3}\times 6\frac{1}{2}=(8\times 6)+(8\times\frac{1}{2})+(\frac{2}{3}\times 6)+(\frac{2}{3}\times\frac{1}{2})=48+4+4+\frac{1}{3}=56\frac{1}{3}$, or

(5)
$$\begin{array}{r} 6\frac{1}{2}\\ 8\frac{2}{3}\\ \hline 48\\ 4\\ 4\frac{1}{3}\\ \hline 56\frac{1}{3}, \text{ or} \end{array}$$

(6) $8\frac{2}{3}\times 6\frac{1}{2}=\frac{{}^{13}\cancel{26}}{3}\times\frac{13}{\cancel{2}_{1}}=\frac{169}{3}=56\frac{1}{3}$

Where the mixed numbers are simple, the first method (4) is desirable. For study period or home work, one method may be used as a check upon another. Draw a rectangle on squared paper $8\frac{2}{3}$ by $6\frac{1}{2}$, and show the four rectangles corresponding to (8×6), $(8\times\frac{1}{2})$, $(\frac{2}{3}\times 6)$ and $(\frac{2}{3}\times\frac{1}{2})$.

(f) *Division by a Fraction.* Several suggestions are given below to help clarify division by a fraction.

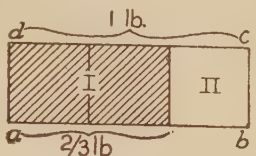


Fig. 5

How many $\frac{2}{3}$ lb. are there in 1 lb? The drawing (Fig. 5) shows clearly $1\frac{1}{2}$.

12 lb. $\div\frac{2}{3}$ lb. $=n$.

How many $\frac{2}{3}$ lb. in 12 lb.?

lb. lb.

$1\div\frac{2}{3}=1\frac{1}{2}$

$12\div\frac{2}{3}=12\times 1\frac{1}{2}=18$

Put into words: In 1 lb. there are $1\frac{1}{2}$ two-thirds lb., so in 12 lb. there are $(12\times 1\frac{1}{2}$ or 18) two-thirds lb.

How many $\frac{2}{5}$ acre in 1 acre? The drawing (Fig. 6) shows $2\frac{1}{2}$.

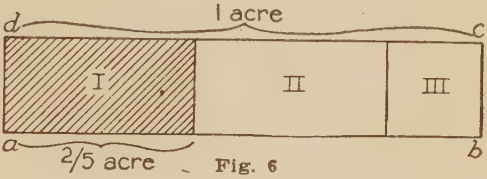


Fig. 6

acre acre

$12\div\frac{2}{5}=n$.

How many $\frac{2}{5}$A. in 12 A.?

$1\div\frac{2}{5}=2\frac{1}{2}$

$12\div\frac{2}{5}=12\times 2\frac{1}{2}=30$

How many $\frac{3}{7}$ of M's salary in all M's salary?

Figure shows $2\frac{1}{3}$ (Fig. 7).

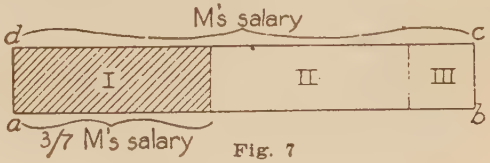


Fig. 7

$12\div\frac{3}{7}=n$.

$1\div\frac{3}{7}=2\frac{1}{3}$

$12\div\frac{3}{7}=12\times 2\frac{1}{3}=28$

We may see this division in other ways:

(a) $12\div\frac{2}{3}=n$.

$12\div 1=12$

$12\div\frac{1}{3}=3\times 12=36$

$12\div\frac{2}{3}=\frac{3\times 12}{2}=18$

How many 1's in 12?

How many $\frac{1}{3}$'s in 12?

How many $\frac{2}{3}$'s in 12?

(b) We may change to a common denominator; as,

$12 \div \frac{2}{3} = n.$

$\frac{36}{3} \div \frac{2}{3} = 36 \div 2 = 18$

(c) $12 \div \frac{2}{3} = n.$

$1 \div \frac{2}{3} = 1\frac{1}{2}$ or $\frac{3}{2}$

$12 \div \frac{2}{3} = 12 \times \frac{3}{2} = 18$

$12 \div \frac{2}{5} = n.$

$1 \div \frac{2}{5} = 2\frac{1}{2}$ or $\frac{5}{2}$

$12 \div \frac{2}{5} = 12 \times \frac{5}{2} = 30$

Out of all these should come the commonly accepted method throughout mathematics; that is, $12 \div \frac{2}{3} = 12 \times \frac{3}{2} = 18$, or the dividend times the reciprocal (or inverted form) of the divisor.

(g) *Finding What Part One Number is of Another.* A vital point at all stages in mathematics is to know how to find and express what part one number is of another. This depends upon clear quick use of the measuring unit. For example, 3 is what part of 12? One sees 3 as the measure; there are 4 such measures in 12, and one 3 is $\frac{1}{4}$ of four 3's. Again, 7 is what part of 28? Answer, $\frac{1}{4}$. Also, 8 is what part of 24? Answer, $\frac{1}{3}$. But when we come to 5 is what part of 12, 7 is what part of 30, and similar cases, where the whole is not a multiple of the part, we find much difficulty. This point must be cleared up, and through the higher grades become clear to the student, if he is to be a free worker in mathematics, for it appears at every turn in his work: 7 months is what part of a year? 1 month is $\frac{1}{12}$ yr.; 7 mo. is $\frac{7}{12}$ yr.; 5 mo. $= \frac{5}{12}$ yr.; 11 mo. $= \frac{11}{12}$ yr.; 3 mo. 15 d. $= \frac{3\frac{1}{2}}{12}$ yr.; 6 mo. 18 d. $= \frac{6\frac{3}{4}}{12}$ yr. 7 sq. ft. is what part of a sq. yd.? Answer, $\frac{7}{9}$. $15.75 is what part of a week's salary of $25? Answer, $\frac{15.75}{25}$.

The child should come to know how to deal with such situations immediately, no matter how complex the situation, and here in fifth grade he should get his introduction to the principle. When the part is $\frac{13\frac{1}{2}}{12}, \frac{6\frac{3}{4}}{12}, \frac{15.75}{25}$. he must apply the principle he has at command in simple fractions, of dividing or multiplying both terms of the fraction by the same numbers; as, $\frac{3\frac{1}{2} \times 2}{12 \times 2} = \frac{7}{24}, \frac{6\frac{3}{4} \times 5}{12 \times 5} = \frac{33}{60} = \frac{11}{20}, \quad \frac{15.75 \times 100}{25 \times 100} = \frac{1575 \div 25}{2500 \div 25} = \frac{63}{100}$ or $\frac{15\frac{3}{4} \times 4}{25 \times 4} = \frac{63}{100}$. This guarantees much freedom in handling numbers in advanced school work, and in the business world. This point is discussed in the sections on the Seventh Year and Eighth Year. Refer to it there.

Problems. 1. A man spends $\frac{2}{3}$ of his salary for all his expenses, which are $1,500. What is his salary? How much can he save? Refer to Figure 5.

$\frac{2}{3}$ of salary $= \$1500$

Salary $= 1\frac{1}{2} \times \$1500 = \$2250$

Savings $= \frac{1}{2}$ of $\$1500 = \$750$

See that all his salary is $1\frac{1}{2}$ times as large as $\frac{2}{3}$ of his salary.

2. During the war a family bought $\frac{5}{8}$ of a barrel of flour, and the bill was $6.50. What was the price per barrel?

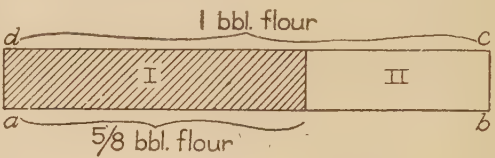


Fig. 8

Cost of $\frac{5}{8}$ bbl. $= \$6.50$

Cost of 1 bbl. $= 1\frac{3}{5} \times \$6.50 = \$10.40$

The drawing (Fig. 8) shows the whole barrel is $1\frac{3}{5}$ times as much as $\frac{5}{8}$ of bbl.

3. Refer to Figure 6. Mr. Brown's lot is $\frac{2}{5}$ of an acre. He paid $1,700 for it. What is the value of an acre of such land?

Value of $\frac{2}{5}$ A $= \$1700$

Value of 1 A $= 2\frac{1}{2} \times 1700 = \$4250$

In each case the mixed number may be used as a fraction; for example, $\frac{5}{2}$ of $1700 = $4250, $\frac{8}{\beta}$ of $\frac{\overset{130}{\$6.50}}{1} = \$10.40$.

Note the clear mathematical expression in the solution of these problems. Good mathematical form is essential to good work; the eye helps the mind. These problems may, of course, be reasoned out another way; for example:

Cost of $\frac{5}{8}$ bbl. $= \$6.50$

Cost of $\frac{1}{8}$ bbl. $= \frac{\$6.50}{5} = \$1.30$

Cost of 1 bbl. $= 8 \times \$1.30 = \$10.40$

4. Mr. Howard puts 1 pk. 3 qt. of peaches into each basket. Sept. 16, he shipped to Chicago 80 baskets. Mrs. Howard the same day shipped 5 crates of eggs, $10\frac{1}{2}$ doz. in each crate. The peaches sold at the rate of $.75 a pk. and the eggs $.42 a dozen. How much money did the Howard family get for peaches and eggs?

5. What is the cost of 15¾ tons of coal at $8.40 per ton and $.50 per ton for putting it in?

6. Train the pupils to be sure they know the conditions of a problem before they begin to solve it. Often read a simple problem from an arithmetic not used by your pupils and ask them to estimate quickly what the result will be. Then give the correct answer and commend those who have estimated fairly well. Remember that arithmetic is, largely, "the art of computation."

Devices for the Teacher. Problems like the following will help to pin pupils down to reasoning out problems instead of "fooling with figures." They are especially helpful in any grade where the children are given to working to get an "answer," and are equally willing, for instance, to find a pound of sugar cost $5.00 or 1 cent.

1. I know how much one book costs and how many books I am going to buy; how am I to find what amount I must pay for them?

2. I know how many miles a boat goes in an hour; how shall I find the distance it goes in a quarter-hour? In fifteen minutes?

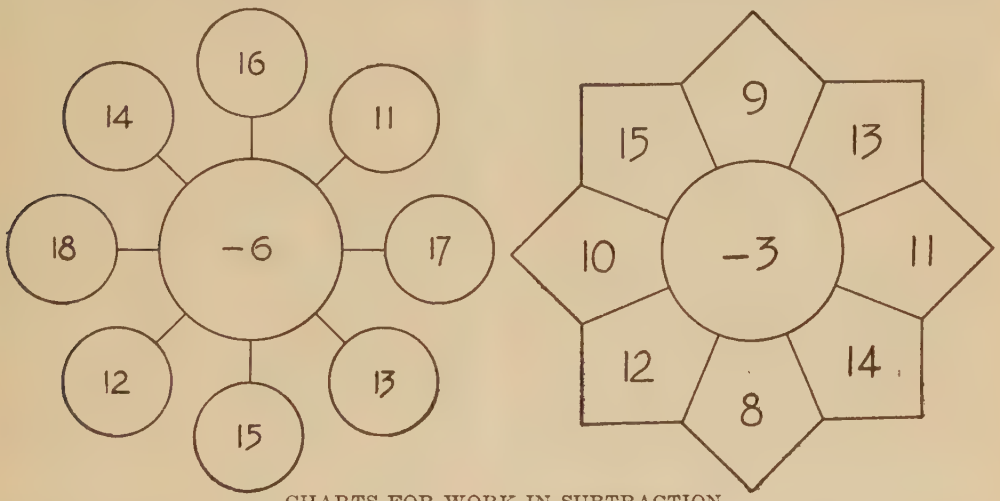
3. John knows the area of a rectangle and also how wide it is. How can he find its length?

4. A girl's weight was taken in 1910 and also in 1911. How may her gain in weight be found?

5. I know what the payroll per week is for a group of 16 men who all have the same wages. How can I find the daily wages of one man?

6. These children are 12, 10, 8 and 4 years old respectively. The three older children are to pay the expenses of their cart and pony out of their own money in the ratio of their ages. The first month the expenses are $15. What must each one contribute?

7. Find the cost of this birthday luncheon: 3 dozen sandwiches 8½¢ each; 2¾ lb. chocolates at 80¢; 12 grapefruit, 3 for 25¢; 2½ lb. nuts at 45¢; 15 roses at $1.20 a doz.; 1½ lb. raisins at 22¢ and 2 cakes at $1.40 each.



CHARTS FOR WORK IN SUBTRACTION

Review and Extension of Work in Whole Numbers. (1) *Subtraction.* If this chart is before the class, pupils may be called upon to recite as the teacher points to the different numbers on the outside row, and pupils may recite in turn, or pupils in turn may be "teacher" and use the pointer.

(2) *Addition.* Have children add columns of 10 numbers of not more than 3 digits. (1) Add from bottom; (2) add from top down. Or, (1) add putting down full answer of each column; (2) add with the usual "carrying." Let each method be a check upon the other. Vary the length of the columns and the number of digits in each number.

(3) *Multiplication.*

(1) $86 \times 9 = 720 + 54 = 774$
$45 \times 8 = 320 + 40 = 360$

(2) Go on with tables of 13's, 14's, 15's, etc., at least to the product nearest to 100, as $8 \times 13 = 104$, $7 \times 15 = 105$.

(4) Multiply, putting down full product of each multiplication; then multiply, putting down product with carrying. Use one method as check upon the other.

(5) Refer to helps in Third Year, Fourth Year and Sixth Year.

(6) Long division must be reviewed and extended.

Sixth Year

General Suggestions. The work of the Fifth Year gave, by means of the study of fractions, an opportunity for a review of the meaning of number; and the work of the Sixth Year, by means of the study of the decimal fractions, offers the most desirable opportunity for a review and an added appreciation of our decimal notation. Here again, as in the study of whole numbers, the child sees the meaning of zero; of place value; of our number base 10. So at this time the child who has been slow to appreciate these vital points finds an opportunity to meet them again with a new element added; that is, the fraction element. Accordingly, the Sixth Year finds the child familiar with whole numbers and fractions, because of his previous work, and finds him entering upon a survey of both with renewed interest, and with opportunity for greater achievement in both, and ready for application of number to commercial and industrial situations.

Outline of Work. 1. *Varied Processes.* Multiples and factors. Tests of divisibility. Greater facility in fundamentals.

2. *Fractions.* Fractions, decimal and common, used interchangeably and freely, applied to business problems.

3. *Denominate Numbers.* Oral and written exercises in changing denominate units in all tables used in previous grades.

Concrete work in the larger measures, as rod, mile, cord, etc.

4. *Mensuration.* Measurement of rectangles and other quadrilaterals, using larger units, triangles and rectangular solids, as in lumber and wood.

5. *Problems.* Have pupils make up practical problems involving principles studied, and then solve them. Have problems involving common and decimal fractions as used in industrial and commercial life familiar to them.

Helps on Outline. (1) Familiarity with factors and multiples gives a sense of power, a mastery in dealing with number, that adds much to the joy of the student. He feels a control when he recognizes, for example, 85, 68 and 51 as a family of 17's. He can do something with them; they no longer block his path. The child should be trained to look at numbers with this in mind: "What can I do with that group of numbers?"

Two great aids in this direction are factoring and divisibility of numbers; they are of course akin to each other, but included in factoring is the idea of *common factor* and *greatest common factor.* The child should come to know 72 as 8 9's or 4 18's or 3 24's, so that he may use whichever fact suits his need. He should extend his formulated number facts in each grade until $5 \times 13 = 65$ or $14 \times 14 = 196$ is as familiar to him as $5 \times 9 = 45$. The facts as to divisibility by 2, 3, 4, 5, 6, 8, 9 and 11 should be his. In this grade, the reason for some or all may be understood, but the facts of all may certainly be familiar to children of this grade.

2. In pursuing the more difficult work in fractions, make sure that the pupils really grasp what they are doing. Frequently ask them to show the problem by using some concrete material, as cubes, squares, drawings, etc. The way into a subject is through the concrete. It is not the perception of the objects that gives the idea; it is the using of those things in a constructive way.

3. Encourage pupils to solve these review problems in denominate numbers without the use of pencils, as far as possible. Do not scorn "number downs" because the children are "too old for games." They are not too old for spell downs, so how can they be too old for competitive "number downs"? Give a series of rapid written or oral review exercises involving changing denominate units from one form to another, as:

1 yd. = ? ft. ? in.

1 yr. = ? mo. ? wk. ? da.

4. Drawing to a scale should be done by the pupils on the blackboard or on paper, to illustrate many problems in the larger measures. Much training in computation, exactness, neatness, etc., is thus gained.

5. The occasional "making up" by the pupils of problems involving the principles under consideration is of great aid in forcing the pupil out of his attitude of taking only what is handed to him. It increases his insight and his ability to know what to do, when to do it and how to do it.

Decimal Fractions. For several centuries people wrote whole numbers by means of the 9 digits and zero, and place value, but it was not until the sixteenth century that the happy thought or stroke of genius extended this same system of writing numbers to fractions. Stevinus of Bruges and others of his time began to write "fractions as whole numbers." All that was needed to extend the

system was a separatrix. Many different methods were used; as, 6)12, 6 12, 6'12" and others more complicated, to mean six and twelve-hundredths. We, of course, have decided upon the period or decimal point as our separatrix in America. The history of decimal fractions as found in any history of mathematics is a great help in teaching the subject.

1. *Writing of Decimal Fractions.* Write $\frac{1}{10}$, $\frac{2}{100}$ as .1, .02; then .12, and read as 1 tenth, 2 hundredths; then reduce and read it 12 hundredths, realizing that 1 tenth is 10 hundredths. So with reading. First read 135 as: 1 tenth, 3 hundredths, 5 thousandths; then see .1 as 10 hundredths or as 100 thousandths, and .03 as 30 thousandths, and so see the whole as 135 thousandths. Apply just the same principles of place value that we use in integers.

2. *Addition and Subtraction of Decimal Fractions.* These present no idea that has not been met in integers, and no stress should be laid upon these processes. The child adds each column, just as in the integers, and places the sum and "carries," just as integers.

3. *Multiplication.* See this through the whole number, not through the common fraction, and emphasize place value, as follows:

(a)	(b)	(c)
256	25.6	2.56
×78	×78	×78
2048	1996.8	199.68
1792		
19968		

(d)	(e)	(f)
256	256	25.6
7.8	.78	7.8
1996.8	199.68	199.68

(1) The product in (b) compares how with the product in (a)? It is $\frac{1}{10}$ as great, because the multiplicand is $\frac{1}{10}$ as great as in (a) and the multiplier is the same.

(2) How do we get a number $\frac{1}{10}$ as great as 19968? By moving the decimal point one place to the left, which moves each digit one place to the right and so divides its value by 10.

(3) The product in (c) is $\frac{1}{10}$ as great as in (b), and we get that product by moving the decimal point one place to left in 1996.8, which gives 199.68.

(4) In (d) the product is $\frac{1}{10}$ as great as in (a), because the multiplicand is the same as in (a) and the multiplier is $\frac{1}{10}$ as great.

(5) We get that product by moving the point one place to the left, so dividing the product (a) by 10.

(6) In (f) the product is $\frac{1}{100}$ as large as product (a), because the multiplicand is $\frac{1}{10}$ as large as in (a), and the multiplier is $\frac{1}{10}$ as large as in (a).

To generalize—the product varies as the multiplicand and multiplier vary. To find the product in decimal fractions or decimal mixed numbers, multiply as in integers, and point off as many decimal places as there are in the multiplicand and multiplier together. Pay no attention to the decimal point while multiplying. To do so is confusing, and serves no purpose.

4. *Division of Decimals.* This follows easily from multiplication.

Recognize the dividend as a product; for example, $199.68 \div .78 = n$, must be seen as $.78 \times n = 199.68$. What number multiplied by .78 gives 199.68? We see that n has no decimal places, because the product has only 2 and the factor given has 2.

$199.68 \div 7.8 = n$, means $7.8 \times n = 199.68$, and we see that n has one decimal place. So in division we see how many decimal places the quotient contains before we divide. In such cases as the following, it is somewhat difficult to see this: $\$3 \div \$75 = n$, means $\$.75 \times n = \$3$. Here we must recognize that the product of $.75 \times n$ must have 2 decimal places at least. Accordingly, we must think of 3 as 3.00, and the problem becomes $\$3.00 \div \$.75 = 4$. See how the zeros are dropped from the product. I buy 4 pairs of gloves at \$.75 apiece. Cost $= 4 \times \$.75 = \$3.00$. When we divide we restore the zeros that were dropped from the product.

5. *Reduction of Common Fractions to Decimal Fractions.* Never before has there been such demand in the commercial and scientific world for freedom and ease in this particular bit of arithmetic. Indeed, this is the century of the decimal, and we feel the need of fluent translation of the common fraction into the decimal fraction.

$$\frac{1}{8} = \frac{1.00}{8}$$ (which is the concise expression for $\frac{1}{8} = \frac{1}{8}$ of 100 hundredths).

$$\frac{3}{8} = 3 \times \frac{1.000}{8} = \frac{3.000}{8} = .375$$

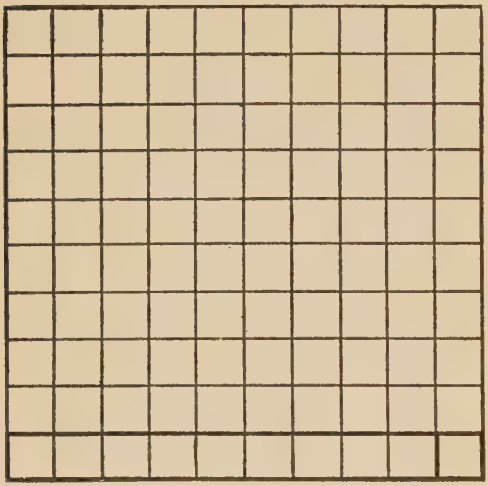
$$\frac{5}{8} = \frac{5.000}{8} = .625$$

$$\frac{1}{16}=\frac{1.0000}{10}$$

$$\frac{3}{16}=\frac{3\times 1.0000}{16}=\frac{3.0000}{16}=.1875$$

To generalize—To reduce a common fraction to a decimal fraction, change the numerator to tenths, hundredths or thousandths and so forth, and divide by the denominator. The quotient will be, of course, the same name as the numerator, so we say, "Point off as many decimal places in the answer as there are in the numerator."

6. Squared paper is an excellent aid in seeing decimal relations. For instance, using the 10×10 square drawn on the blackboard or on a large sheet of manila paper (also, when possible, by children using the cross-section paper, invaluable for showing mathematical relations), give a series of "quick" problems like the following:



DECIMAL SQUARES

I place a value of $7 on the 100 squares; show me one row and give the value. Write the equation (1/10 of $7=$.70). Show me one of the squares and give its value. Write the equation (1/100 of $7=$.07). I place a value of $.05 on 10 of these squares. Find the value of the 100, etc. Let the entire 100 squares represent a ton of coal. Show .05 of the squares and tell how many pounds are represented. Show .20, .10, etc., until the 100 squares have been used. Thus

.05 of T= 100 lb.
.10 of T= 200 lb.
.20 of T= 400 lb.
1.00 of T=2000 lb.

7. *Surface.* Surface is extended this year to the triangle, parallelogram and trapezoid. The general principle is established of comparing all figures with the rectangle.

1. The triangle ABC in Fig. 1 is divided into 2 right triangles I and II. ABC is seen to be equal to ½ of the rectangle ABNO. By cutting, and pasting I on III, the student sees the triangle ABC will make the rectangle MBNC, or he may cut, paste II on IV, and see ABC will make MCOA. He sees that the area of the triangle is equal to the area of a rectangle of the same altitude and whose base is half that of the triangle. This is stated:

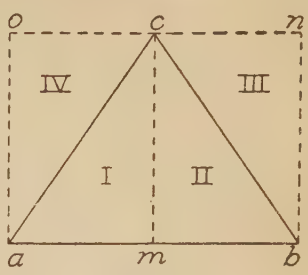


Fig. 1.

$$\text{Area of triangle}=\frac{\text{Base}}{2}\times\text{Altitude}.$$

2. In Fig. 2 the child sees triangle ACB =triangle ADB, and that I + II = CADB; and so he sees that the area of triangle=½ area of rectangle whose base and altitude are the same as those of the triangle.

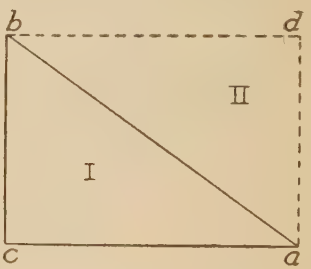


Fig. 2.

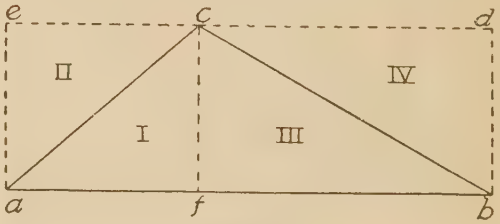


Fig. 3.

Fig. 3 shows triangle I=triangle II, III= IV, and so triangle ABC=½ of rectangle ABDE. The fact is realized that the area of a triangle equals ½ the product of the base and altitude. The best expression for it is this: $\text{Area}\triangle=\frac{B\times A}{2}$.

From Figure 4 he sees a parallelogram equal to a rectangle of the same base and

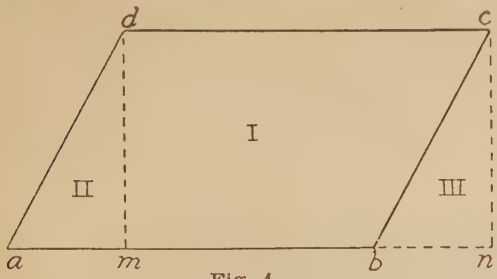


Fig. 4.

altitude. Cut out and paste in rectangle form.

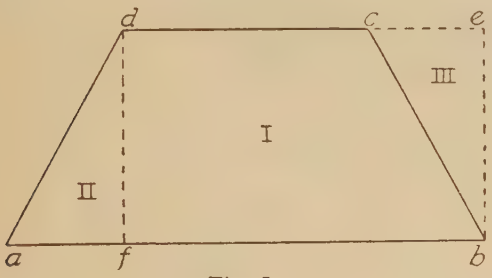


Fig. 5.

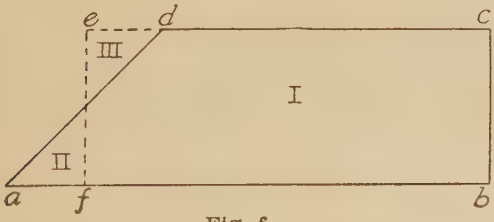


Fig. 6.

In Figures 5 and 6, the student sees the trapezoid is equal in area to a rectangle whose base is the average base of the trapezoid, and whose altitude is the same as that of the trapezoid. Put into good concise form, it appears: Area of trapezoid=

$$\frac{\text{lower base}+\text{upper base}}{2}\times\text{altitude.}$$

Problems. 1. Find the value of \$320 per acre, of a triangular piece of land, base 100 rd. and altitude 80 rd.

$$\text{Cost}=\frac{100\times 80}{\cancel{160}}\times\frac{\overset{2}{\cancel{\$320}}}{1}=\$16000$$

2. How many acres in a piece of land of trapezoidal shape, long base 120 rd., short base 60 rd. and altitude 80 rd.?

$$\text{Number of acres}=\frac{120+60\times 80}{2\times 160}=45$$

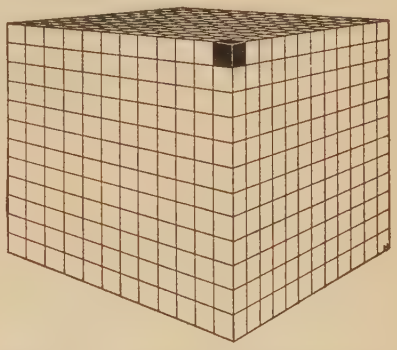
8. *Volume.* This is extended into more complex conditions than in the Fifth Year.

1. Volume should be seen as dependent upon area of base and height or depth.

2. Learn to recognize (a) the solid units of measure; cu. in., cu. ft., and so on, and (b) the commercial measures, gallon, barrel, load, bushel, cord, board foot, etc.

3. Recognize that these last are measured in terms of the others, as, 1 gal.=231 cu. in.; 1 load=1 cu. yd. and so on.

4. In (3) the work of this grade advances beyond that of the two preceding years.



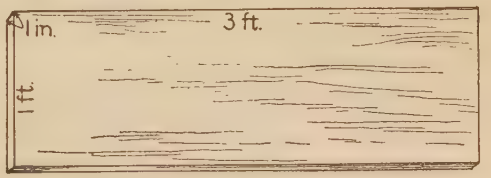
5. Have inch cubes at hand; build a cu. ft.; build as many cu. ft. as make a cu. yd. Build of strong paper or cardboard.

Problems. The following problems are applicable:

1. How many tons of coal will fit in a bin (allowing 35 cu. ft. for 1 T) 14 ft. by 8 ft. by 5 ft.?

$$\text{Number of T}=\frac{\overset{2}{\cancel{14}}\times 8\times\overset{1}{\cancel{5}}}{\underset{1}{\cancel{35}}}=16$$

2. How many feet of lumber in a board 16 ft. long, 9 in. wide and 2 in. thick?



How many lumber ft. are shown here?

Number of lumber ft.=16×¾×2=24.

(A lumber foot is 1 ft. square and 1 inch thick.)

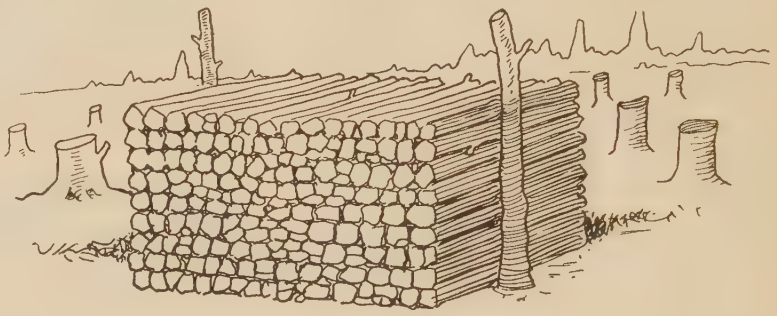
3. How many cu. ft. of air in a living room 20 ft. by 18 ft., and having a height of 9 ft. 6 in.?

A Cord of Wood. A cord of wood is a solidly built pile 8 feet long, 4 feet wide and 4 feet high.

1. How many cords, stove-wood measure, each stick 12 inches long, could be made from a full-sized cord of wood?

2. If the full cord as pictured above is bought for $3.00 and sawed into stove lengths as in problem (1) and sold for $1.25 a cord, what is the profit?

3. If 6 hours' time was required to saw this wood, and labor cost 25 cents per hour, was there anything gained on the transaction?



A CORD OF WOOD

Seventh Year

General Suggestions. The advance work of this year is a general outlook on business problems with percentage as the method of computation. This presents two lines of thought to the student.

(1) He must learn to examine and analyze the business lines in the life about him to find the number relations underlying each of them.

(2) He must accustom himself to think these number relations in hundredths or per cent. He has as a background entire familiarity with whole number processes, and two years of close acquaintance with fractions, common and decimal. His real problem, then, is to get at the number relations in the great business world.

Outline of Work. 1. *Percentage.* Control of all fundamental processes. Special attention to short and effective methods. Get correct mathematical form and expression in every part of the work.

2. *Fractions.* Reach entire familiarity with common and decimal fractions in all processes.

3. *Denominate Numbers.* Further development and application of all measures and weights previously studied. Comparison of United States and foreign money; various applications of square and cubic measure.

Helps on Outline. (1) See percentage as the use of the decimal fraction hundredths. Know 5% as .05; 28% as .28.

(2) See that percentage presents no new number ideas.

(3) Understand each new business situation. By investigation and inquiry at home and among friends in business, the student must become acquainted with discount, commission, profit and loss, taxes, insurance and every line of business that is studied in class.

Home Work. This investigation furnishes most of the home work of this grade. The older members of the family and business friends will be the source of much information to the child. He will consult the newspapers, magazines and government reports for material of this kind also.

4. The class work is to classify and formulate the facts, and build up the mathematics of each line.

5. See that the commission, profit, loss, premium, discount, or interest in any situation is some part (expressed in hundredths) of the sales, investment, insurance price, or principal; for example,

(a) John's father sells automobiles, getting 5% commission. In March his sales amount to $75,000; in April to $100,000. What does he earn each month?

Sales=$75,000
Rate=5%
Com.=.05×$75,000=$3,750.00
Sales=$100,000
Rate=5%
Com.=.05×$100,000=$5,000.00

(b) Mary's sister, a clerk in a department store, gets 12% discount on all goods she buys at that store. She buys a coat marked $80, a dress marked $30 and shoes marked $8. What discount is she allowed?

Marked price=$80+$30+$8=$118
Rate of disc.=12%
Discount=.12×$118=$14.16

6. Examine another important situation involved in such a problem as this: A packing industry finds that an animal that cost them (all expenses included) $54 brings them a net price of $72. They find another animal that cost them $28 brings them a net price of $42. They must know which is the better investment. The solution may be thus expressed:

(a) Cost=$54
S. P.=$72
G.=$72—$54=$18
Part of investment gained=$\frac{18}{54}=\frac{1}{3}$.
Gain %=$33\frac{1}{3}$
(b) Gain=$42—$28=$14
Part of cost gained=$\frac{14}{28}=\frac{1}{2}$. Gain %=50.

In all such problems the point is "What part one number is of another." The gain is what part of the cost? Express that part in hundredths, or per cent.

7. Another situation presents this kind of problem. A man gave 3% of his salary to the Red Cross. He subscribed $55.50 last year. What was his salary?

$$\$55.50=.03\times\text{Salary}$$
$$\text{Salary}=\frac{\$55.50}{.03}=\$1850$$

Note that $55.50 was found by multiplying his salary by .03. We have given the product and one of the factors (.03) to find the other factor (salary). We divide the product by the factor we know.

8. Note that good clear expression of the problem helps much in the solution. By this means the number relation is kept clear to the eye.

This problem contains a new element: A farmer increased his corn acreage 32% this year, and his corn fields contain 10,560 acres now; how many acres had he in corn last year? The student must see that 10,560 A.=1.00 of old field+.32 of old field. 10,560 A.=1.32 × old field. Number of acres in old field=$\frac{10560.00}{1.32}=8000$.

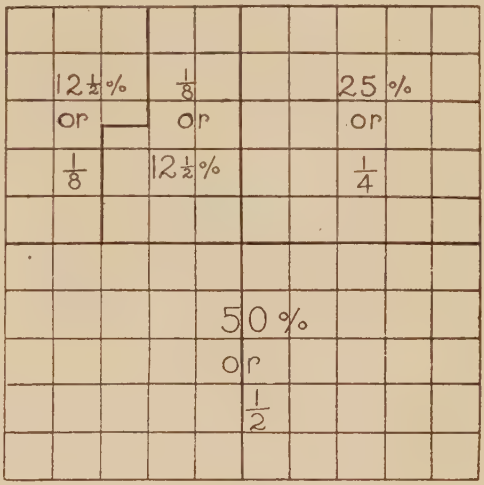
(a) See 10,560 acres as the old field+32% of it.

(b) See 10,560 as the product; 1.32 as the factor you know.

(c) Find the missing factor by dividing the product of the factor you know.

9. *Aliquot parts.* A keen appreciation of the three expressions for the same fractional part is a help to rapid and correct calculation, as follows:

COMMON FRACTION	DECIMAL FRACTION	PER CENT
$\frac{1}{100}$	.01	1%
$\frac{1}{10}$	.10	10%
$\frac{1}{8}$	.12$\frac{1}{2}$	12$\frac{1}{2}$%
$\frac{1}{4}$	.25	25%
$\frac{1}{5}$	.20	20%
$\frac{1}{6}$	.16$\frac{2}{3}$	16$\frac{2}{3}$%
$\frac{1}{16}$	.06$\frac{1}{4}$	6$\frac{1}{4}$%
$\frac{1}{7}$	.14$\frac{2}{7}$	14$\frac{2}{7}$%
$\frac{1}{3}$	.33$\frac{1}{3}$	33$\frac{1}{3}$%
$\frac{3}{8}$	.37$\frac{1}{2}$	37$\frac{1}{2}$%



SQUARED PAPER SHOWING FRACTIONAL PARTS

Write out 10 other fractional parts in the same way.

10. (a) Squared paper (see drawing) is a help in showing the parts as common fractions and as per cent.

(b) Pennies are helpful in seeing the relations between parts. Have 100 pennies at hand and they will clear away many difficulties, for example,

10 pennies=1 dime — 60 pennies=6 dimes
$\frac{\$10}{\$100}=\frac{\$1}{\$10}$ — $60\%=\frac{6}{10}=\frac{3}{5}$
$10\%=\frac{1}{10}$

11. *Interest.* This is a vital topic in this year. There are many interest methods.

(a) The most direct method gives the solution as follows:

Problem—What is the interest on $900 at 6% for 2 yrs. 8 mo. 20 d.?

$$\text{Int.}=2\tfrac{8\frac{2}{3}}{12}\times.06\times\$900$$
$$\text{Int.}=.16\tfrac{2}{3}\times\$900$$
$$\text{Int.}=\$147.00$$

(b) The 6% method gives this solution.

Int. for 2 yr=2×.06×$900=.12×$900
Int. for 8. mo.=8×.005×$900= 04×$900
Int. for 20 da.=20×.000$\frac{2}{3}$×$900=.00$\frac{2}{3}$×$900
Int.=.16$\frac{2}{3}$×900=$147

(c) The 1000 day method is used by many. It gives this solution:

$$\text{Int.}=\frac{\$900\times.980}{6}=\$147.000$$

The theory of this method may be stated as follows:

The simple interest of any sum of money will exactly equal the principal in 1000 days at 36%.

Before proceeding to learn a rule by which to solve a problem under this method, find the interest on \$100.00 for 1000 days at 36%, by the six per cent method. You will find this interest to be \$100.00. You can now without doubt write your own rule for the thousand day method. It is as follows:

Multiply the principal by the number of days, point off three decimal places in the product, and the result is the interest on the principal for the given time at 36%.

If your problem requires the interest at 6%, divide the result by 6.

If 3% is required, divide by 12;

If 4% is required, divide by 9;

12. *Problems.* (1) Michael presents his \$100 Fourth Liberty bond coupon ($4\frac{1}{4}\%$) for semi-annual interest. How much interest does he draw?

(2) 8 mo.$=\frac{2}{3}$ yr.;

$$8 \text{ mo. } 15 \text{ da.}=\frac{8\frac{1}{2}}{12}\text{yr.}=\frac{17}{24}\text{yr.};$$

$$7 \text{ mo. } 12 \text{ da.}=\frac{7\frac{2}{5}}{12}\text{yr.}=\frac{37}{60}\text{yr.}$$

Express the following as part of a year: 4 mo. 18 da.; 5 mo. 10 da.; 8 mo. 20 da.; 2 mo. 24 da.

(3) Express as fractions of a yard,

$$1 \text{ ft. } 9 \text{ in.}=\frac{1\frac{3}{4}}{3}\text{yd.}=\frac{7}{12}\text{yd.}$$

2 ft. 6 in., 1 ft. 8 in., 2 ft. 3 in.

(4) The following are the sales of various departments in a packing house for the month of January, 1919.

Pork sausage	1000
Pork tenderloins	6000
Roast beef	1500
Bacon	4500
Ham	3000

Find what per cent the sales of each department was of the total sales. Test by adding the per cents and see if the total is 100%.

(5) Spend time on real and reasonable problems, as:

Dressmaking problems. Illustration: The dressmaker bought a 20-yd. silk dress pattern at \$2.10 a yd., being allowed, as dressmaker, a discount of 5% and 6% off for cash. She charged her customer the marked price, \$2.10. What was her per cent of profit?

Much valuable material may be gathered from government reports and statistics which may be secured for the asking, for various problems in upper-grade work.

13. *Short Methods.* (a) To multiply by 25, add two zeros and divide by 4.

To multiply by 50, add two zeros and divide by 2.

To multiply by $12\frac{1}{2}$, add two zeros and divide by 8.

To multiply by 125, add three zeros, and divide by 8.

(b) To add unit fractions:

$$\frac{1}{2}+\frac{1}{3}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$$

$$\frac{1}{8}+\frac{1}{5}=\frac{5+8}{8\times5}=\frac{13}{40}$$

$$\frac{1}{6}+\frac{1}{5}=\frac{5+6}{5\times6}=\frac{11}{30}$$

$$\frac{1}{a}+\frac{1}{b}=\frac{a+b}{a\times b}$$

See the answers immediately:

$$\tfrac{1}{4}+\tfrac{1}{9}=\tfrac{13}{36};\ \tfrac{1}{7}+\tfrac{1}{8}=\tfrac{15}{56}$$

(c) To reduce complex fractions to simple fractions:

$$\frac{2\frac{2}{3}\times3}{8\times3}=\frac{8}{24};\ \frac{9\frac{1}{3}\times3}{28\times3}=\frac{28}{84}$$

$$\frac{10\div2\frac{1}{2}}{12\frac{1}{2}\div2\frac{1}{2}}=\frac{4}{5};\ \frac{5\div2\frac{1}{2}}{7\frac{1}{2}\div2\frac{1}{2}}=\frac{2}{3};\ \frac{7\frac{1}{2}\times6}{8\frac{1}{3}\times6}=\frac{45}{50}$$

(d) To multiply such numbers as the following: 45×45, 43×47, 95×95, 98×92.

$$\begin{array}{r} 45 \\ 45 \\ \hline 2025 \end{array}$$

$5\times5=25$

Add 1 to 4 of the multiplier, multiply $5\times4=20$

$$\begin{array}{r} 95 \\ 95 \\ \hline 9025 \end{array}$$

$5\times5=25$

$10\times9=90$

$$\begin{array}{r} 98 \\ 92 \\ \hline 9016 \end{array}$$

$2\times8=16$

$10\times9=90$

This short method is seen to be right by seeing the multiplication in full as below:

95	98
95	92
5× 5=25	2×8=16
5×90	2×90
5×90	8×90
90×90	90×90
100×90+25=9025	100×90+16=9016

125	5× 5= 25
125	13×12= 156
15625	
402	2× 8= 16
408	41×40=1640
164016	

This seems a bit of magic to the uninitiated, but is only a clever "short cut," when you see the reason for it as shown above.

14. For suggestions as to *Surface* and *Volume,* see Sixth Year and Eighth Year.

Eighth Year

General Suggestions. This year's work has several distinct purposes.

(1) It reviews the subject matter of arithmetic, whole numbers and fractions. This review should take the form of generalizations and lead the student on from the language of arithmetic into the language and form of algebra and higher mathematics.

(2) From the work in mensuration it carries the student through constructive and intuitional geometry, up toward the demonstrational geometry of the high school.

(3) It gives attention to skill in rapid addition and subtraction, presenting many devices for acquiring such skill, and to clever manipulation of decimal fractions.

(4) It deals with areas and solids not studied in the previous years, as well as some business situations not covered before.

Outline of Work. All processes with integers and fractions; square root; area of circle, volume and surface of cylinder, cone, sphere, right triangle; business problems.

Helps on Outline. 1. The help suggested in earlier grades, to forward practice in the fundamental processes, is emphasized here; namely, that the student have means of checking his work, and thus become responsible and confident. In addition check (1) by adding up and down; (2) by separating column, and adding in parts; (3) and, most enjoyable and effective, by putting down the entire answer to each column and combining these partial sums; as follows:

753	
698	The zero may be omitted, and the sums will appear thus:
9046	
205	
8462	
738	
33	33
260	26
2600	26
17000	17
19893	19893

What is known as the "Bankers' Method" may be used as a check upon the student's ordinary method.

Bankers' Method. The advantage of this method over the above method is that the result is always in sight without making the second addition, since the tens figure carried from one column to another is added to each partial sum. Immediately to the right of the problem below is given the partial addition.

The number shown as the sum is not the result of adding the partial additions, but represents the last addition and the last figure in each of the other partial additions. The usual way of showing an addition by the bankers' method is as in the third row of partial additions. One would then read for the sum the last two figures set down and the units figure in each of the other numbers:

2480	13	13
725	29	29
6844	31	31
2893	16	16
3251	16193	16193

In subtraction, check (1) by adding subtrahend and difference—the sum must be the minuend; (2) by using one subtraction method as a check upon another one; for example:

96421
6832
89589

Subtract using the method 2 from 11, 9; 3 from 11, 8; 8 from 13, 5, and so on. Now use the method 2 from 11, 9; 4 from 12, 8; 9 from 14, 5; 7 from 16, 9; 1 from 9, 8.

Check multiplication and division by writing out each product in full; for example:

(a)	(b)
824	824
96	96
24	4944
120	7416
4800	79104
360	
1800	
72000	Use (b) first and check with (a)
79104	

158208÷192=n.

(a)

```
  824
192)158208
  1536
   460
   384
    768
    768
```

(b)

```
  824
100+90+2)158208
          800= 8×100
          782
          720= 8× 90
           62
           16= 8×  2
          460
          200= 2×100
          260
          180= 2× 90
           80
            4= 2×  2
          768
          400= 4×100
          368
          360= 4× 90
            8
            8= 4×  2
```

Note: Refer to Division, in Fourth Year.

Check division by multiplying divisor by quotient; the product should equal the dividend. Another attack on addition is suggested below:

Cross Addition. An interesting mental exercise, but one lacking elements of practicability, is performed by adding to the upper number the units, tens and hundreds successively of the next number below. Variations can be had by adding from left to right or by beginning below and adding above. In oral recitation, drop "and" and "are" and simply give results. Examples:

```
                    38
38 and 5 is 43 and 40 is }  45
83 and 3 is 86 and 70 is }  73
                   156 }   156
```

```
225   Add the hundreds .....1700
862   See 2, 6, 2 in tens, another 100..1800
324   See 1 ten in 415 and another
415     in 5, 5 of units.....1820
1826  and 4, 2 units.....1826
```

2. **Review and Generalization.** After many individual cases are worked out in any line, the student sees a principle and sets it forth in good form.

(a) In area he says:

Area of any rectangle=length×width, and writes it:

$$\text{Area } \square = l \times w.$$

Area of triangle is generalized after many observations (refer to Seventh Year) thus:

$$\text{Area } \triangle = \frac{B \times A}{2}$$

Also the parallelogram and trapezoid:

$$\text{Area } \square = B \times A$$

$$\text{Area of a trapezoid} = \frac{B+B'}{2} \times A.$$

(b) In volume, he formulates the results of much observation and experiment with various solids, and puts them into good mathematical form, as follows:

Volume of prism=area of base×H

Volume of cylinder=$\pi r^2 \times H$

or, volume cylinder=$\pi r^2 h$. (Refer to page 209 for explanation of π.)

(c) In general he draws conclusions, and formulates those conclusions. He says the

Perimeter of a square=4×one side or,

$$\text{Perimeter } \underset{s}{\square} = 4S$$

$$\text{Area } \underset{s}{\square} = S^2$$

$$\text{Perimeter } \underset{l}{\square} w = 2\,l + 2\,w \text{ or } 2\,(l+w)$$

He comes to see how to express general mathematical facts. The rate of speed is expressed by $\frac{\text{whole distance}}{\text{number of hours}}$ or, rate=$\frac{d}{n}$.

How much money does each of 4 boys get if a farm is divided equally among them? $\frac{f}{4}$.

$$\frac{1}{5}+\frac{1}{7}=\frac{5+7}{5\times 7}$$

$$\frac{2}{5}+\frac{2}{7}=\frac{2(5+7)}{5\times 7}$$

$$\frac{1}{a}+\frac{1}{b}=\frac{a+b}{a\times b}$$

$$\frac{2}{a}+\frac{2}{b}=\frac{2(a+b)}{a\times b}$$

The student sees and says that what is true of $\frac{1}{5}+\frac{1}{7}$ is true of any unit fractions; what is true of $\frac{2}{5}+\frac{2}{7}$ is true of any fractions with numerator 2.

Square Root. (1) Build squares on the following lines: 3 inch, 4 ft., 8 mi., 9 rd., 6 yd. Give the areas of each. Show the use of the exponent 2. $3^2=9$ means that a square is built on a line 3 units in length, and the square contains 9 square units corresponding to the unit of length in the base line.

(2) Each one build squares; give areas, and see if class can tell length of side. Here introduce the radical or root sign which asks the question—"What number multiplied by itself gives the number under the sign?"

$100=n$; $144=n$; $400=n$, etc.

Learn the squares through 25; note the endings of squares are 1, 4, 9, 6, 5, 6, 9, 4, 1.

$1^2=1$
$2^2=4$
$3^2=9$
$4^2=16$
$5^2=25$
$6^2=36$
$7^2=49$
$8^2=64$
$9^2=81$

Know squares of tens; as, $20^2=400$; $30^2=900$. Know how to square numbers ending in 5, at sight. (Refer to Seventh Year.)

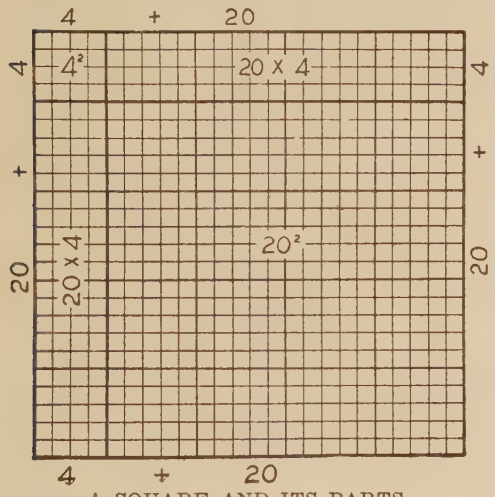
Square numbers as follows:

$24^2=(20+4)^2=20^2+(4\times20)+(4\times20)+4^2$

$400=20\times20$
$80=20\times4$
$80=4\times20$
$16=4\times4$
576

See that the square is made up of the square of the tens and the product of the tens and the units, twice, and the square of the units.

Draw on squared paper many squares (see illustration) showing this. Square as many numbers; as,



A SQUARE AND ITS PARTS

$36^2=30^2+2\times(6\times30)+6^2$
$48^2=1600+2\times320+64$
$54^2=50^2+2\times(4\times50)+4^2$

Omit one part and see who can supply it, not knowing the number squared; as,

$n^2=900+2(4\times30)+n^2$
$n^2=t^2+2(80\times4)+4^2$

One sees from the 4×30, that 4 is the units. Therefore the missing term is 16, the number is 34. In the second expression one sees 80 is the tens and 6400 is the missing part, and the number is 84. Supply the middle term:

$n^2=8100+2(\quad)+16$
$n^2=2500+2(\quad)+49$

One sees 8100 as 90^2 and 16 as 4^2, so the number is 94, and the middle term 4×90.

Having enough of this work to become really familiar with the meaning of the process of squaring, the student can find the root of any square whose root has only 2 digits; for example, $\sqrt{6889}=n$.

The largest square of tens in 6800, is 6400, and the tens must be 80; the number must be 80+units, but the square ends in 9, so the units must be either 3 or 7. In other words,

$\sqrt{6889}=83$ or 87.

Look at others in the same way:

$\sqrt{1764}=42$ or 48
$\sqrt{6241}=79$ or 71
$\sqrt{1444}=38$ or 32
$\sqrt{2916}=54$ or 56

Looking a little more closely, one takes 40^2 out of 1764 and has 164 left, which he sees is just enough to make (2×40) twice and 2^2. Take 70^2 out of 6241 and the remainder is 1341, entirely too much for (1×70) twice $+1^2$; hence it must be $(9\times70)\,2+9^2$, and the number is 79.

Find by this method the following:

$\sqrt{1156}$, $\sqrt{2116}$, $\sqrt{8649}$, $\sqrt{5625}$, $\sqrt{2401}$.

To find the square root of any number:

$\sqrt{2209}=n$.

$40+7=47$
$2209=\text{tens}^2+2\times(\text{tens}\times\text{units})+\text{units}^2$
$1600=\text{tens}^2$
$2\times40=80 \mid 609=2\times\text{tens}\times\text{units}+\text{units}^2$
$560=2\times\text{tens}\times\text{units}$
$49=\text{units}^2$
$49=7^2$

$\sqrt{178929}=?$

423
$17:89:21$
$16=\text{tens}^2$
$2\times40=80 \mid 189$
$160=2\times\text{tens}\times\text{units}$
29
$4=\text{units}^2$
$2\times420=840 \mid 2529$
$2520=2\times\text{tens}\times\text{units}$
$9=\text{units}^2$
$9=3^2=\text{units}^2$

Right Triangle. This figure has been of interest to mathematicians for many centuries; long before Christ the Egyptians studied it, and an early Greek set forth the relation between its long side and the other two sides. By drawings and cuttings as in the illustration (see Fig. 1 and Fig. 2) you can find this same truth, namely, that the square built

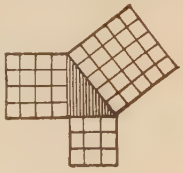


Fig. 1.

on the long side (the hypotenuse) equals the sum of the squares built on the other two sides. Put in good form, it reads $H^2=B^2+A^2$. This relation is very important in many kinds of practical and scientific work; it enters into computations of distance,

Area of Circle. Following the general principle of finding areas; that is, comparing each with the area of a rectangle, we have an interesting problem in the area of a circle. To compare the area of the circle with the area of the square built on its

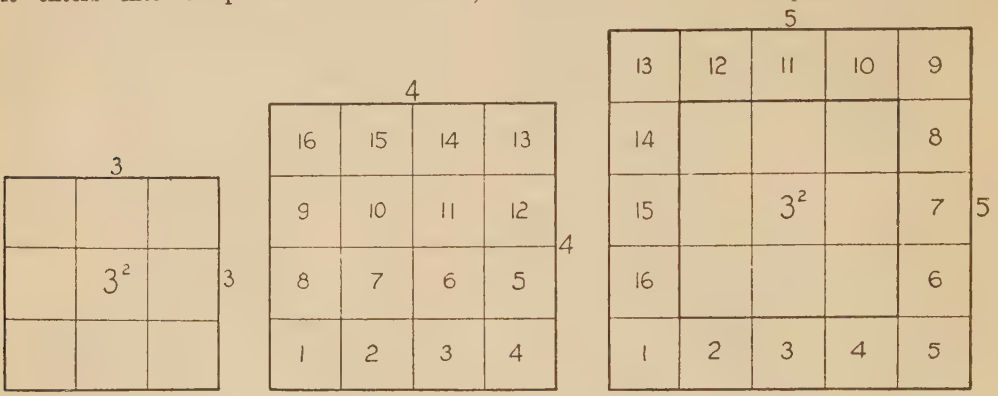


Fig. 2.

construction of buildings, roads, finding of areas, etc. To find the area of the hexagon, one must know the altitude of the triangles —that is, the line OM (see Fig. 3). We

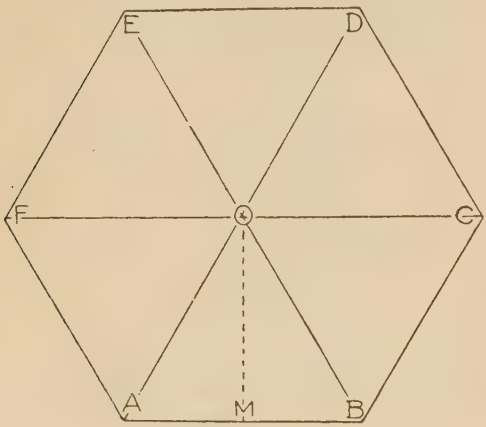


Fig. 3.

have the right triangle OMB. The line OB is the radius of the circle and the hypotenuse of the triangle, and is 10.

We use the formula which we have just found:

$$
\begin{aligned}
H^2 &= B^2+A^2\\
10^2 &= 5^2+A^2\\
100 &= 25+A^2\\
A^2 &= 75\\
A &= \sqrt{75}\\
A &= 8.6+
\end{aligned}
$$

$$\text{Area of 1 tri.} = \frac{10\times 8.6}{2}$$

$$\text{Area of hex.} = \frac{10\times 8.6}{2}\times 6$$

radius: (1) count the little squares in the surface of the circle (see Fig. 4), combining the small parts of squares around the circumference as best the eye can do it, and (2) note the number in r^2, which is seen to be 100; then (3) find how many times as large the circle is as the square.

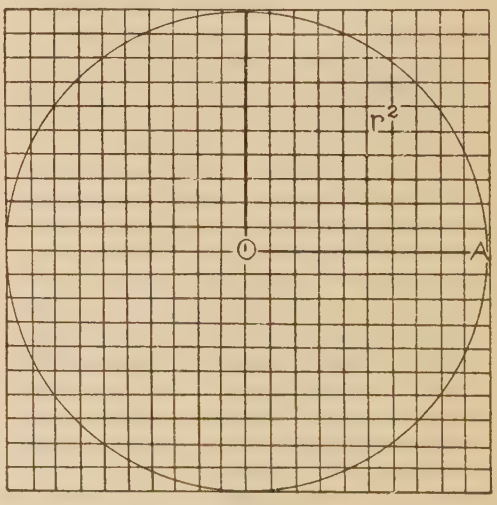


Fig. 4.

Do this with circles of radius 5, 12, and so on. Some students should take one radius and some another. By careful counting you will find the area of the circle to be about $3\frac{1}{7}$ times as great as the square of the radius.

This ratio has been proved to be about 3.14159, and in common use we have the formula—

Area of circle $= 3.1416 \times r^2$

We use this number so often in mathematics, and it is so long, we have agreed to use a letter to stand for it—the Greek letter π (pi), and so the formula reads:

Area of circle $= \pi \times r^2$

Problems. 1. How many acres in a circular park of radius 320 rd.?

Area of circle $= \pi \times r^2$

$r = 320$ rd.

$$\text{Area in acres} = \frac{3.1416 \times 320 \times 320}{160}$$

2. Do you see that two circles will compare in area as the squares of their radii? A circle of radius 10 ft. is $\frac{100}{25}$ or 4 times as large as one whose radius is 5 ft.

There are other ways of finding the area of a circle, given in your arithmetics. Compare them with this method.

Volumes. A general principle we may follow in finding volumes, as in finding areas, is to compare the new solid with one whose volume we know.

Fig. 5.

Compare the pyramid with the square prism of the same base and altitude (Fig. 5).

(1) Make both in cardboard; fill pyramid with salt, sugar or sand and fill the square prism from it. What do you find?

(2) Cut both figures out of soap or potato, or make out of clay.

(3) Weigh them. How do they compare in weight?

(4) See how much water each of the solids displaces. How do the quantities compare?

(5) Can you think of any other way to compare them?

(6) From careful comparisons it is found that the volume of a pyramid is $\frac{1}{3}$ the volume of a prism of equal base and altitude, or, the

$$\text{volume of a pyramid} = \frac{\text{area of base} \times h}{3}$$

Compare volumes of cone and cylinder (Fig. 6) as you did pyramid and prism. It is found that the volume of a cone is $\frac{1}{3}$ of the volume of a cylinder of the same base and altitude, or, the volume of a cone $= \frac{\pi \times r^2 \times h}{3}$.

Problems. 1. How much space in a tent 12 feet in diameter and 9 ft. high? (Fig. 7).

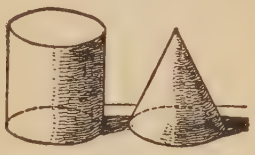


Fig. 6.

2. How many cones 2 inches in diameter and 4 inches deep, will a quart of ice cream fill?

3. How much space in the largest of the Great Pyramids, if its base is 764 ft. square, and its altitude is 480 ft.?

Fig. 7.

Sphere. There is an interesting method of finding the surface of a sphere. (Fig. 9)

(1) Cut the sphere into hemispheres.

(2) Wind cord about the flat surface of the halves, and also around the curved surface, as indicated in the drawing. (Fig. 10)

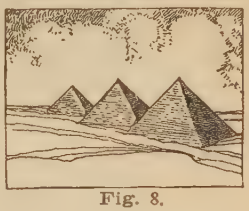


Fig. 8.

(3) Then compare lengths of two cords.

(4) It is found that the cord covering the curved surface is twice as long as the one covering the flat surface. So the area of the entire curved surface of a sphere is equal to the area of the surface of 4 circles like the one measured, which is a great circle of the sphere.

Fig. 9

So the fact is expressed in this way: The area of the surface of a sphere is equal to four times the area of one of its great circles, or, the area of a sphere $= 4 \times \pi \times r^2$.

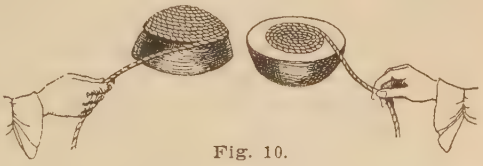


Fig. 10.

Volume of Sphere. This picture (Fig. 11) shows the method of finding the volume of a sphere. The bases of the pyramids are considered as forming the surface of the sphere, while the altitude of the pyramids is the radius of the sphere. Then, since the volume of a pyramid is $\frac{\text{area of base} \times \text{height}}{3}$, the volume of a sphere is $\frac{\text{surface of sphere} \times \text{radius}}{3}$; or, the volume of a sphere $= \frac{4 \times \pi \times r^2 \times r}{3} = \frac{4 \times \pi \times r^3}{3}$.

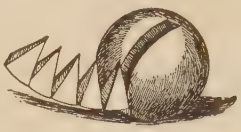


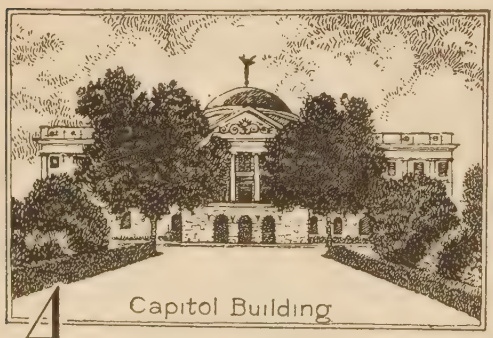
Fig. 11.

Problems. 1. The government surveys all public highways as 4 rods in width. In a district where land is worth $300 per acre, what is the value of the land given over to 12 miles of public highway?

2. If the roads were only 2 rods wide, how much land would be saved for production in a state where there are 120,000 miles of public highway?

Related Articles. Consult the following titles for additional information:

Circle
Cube Root
Cubic Measure
Cylinder
Discount
International Date Line
Interest
Longitude and Time
Mensuration
Metric System
Number, Methods of Teaching
Percentage
Square
Standard Time
Triangle



Capitol Building

ARIZONA, *air i zo'nah*, the forty-eighth state in the American Union, the last territory in continental United States to be admitted to statehood. The international boundary is on the south, Nevada is north, New Mexico is east, and on the west are Nevada and California. The area of the state is 113,956 square miles, only 146 of which are water. Only four states are larger—Texas, California, Montana and New Mexico. In 1910 the population was 204,354, less than two persons to the square mile. In 1917 it was estimated to be 263,788. Nearly one-third of the people are Mexicans.

Surface. Detached mountains stretch through Arizona from the southeast to the northwest and divide it into two parts, which are nearly equal in area. The northeastern portion consists of a high plateau, upon which rise isolated ranges and detached buttes and mesas. The plateau is studded with hills and cut by deep canyons, through which in former ages streams of considerable magnitude flowed. The present streams are dry a good portion of the year. Many of them have considerable and regular underflow available by pumping for irrigation. The Grand Canyon of the Colorado River, which is the most remarkable gorge in the world, runs across the northwestern part of Arizona and along its western boundary.

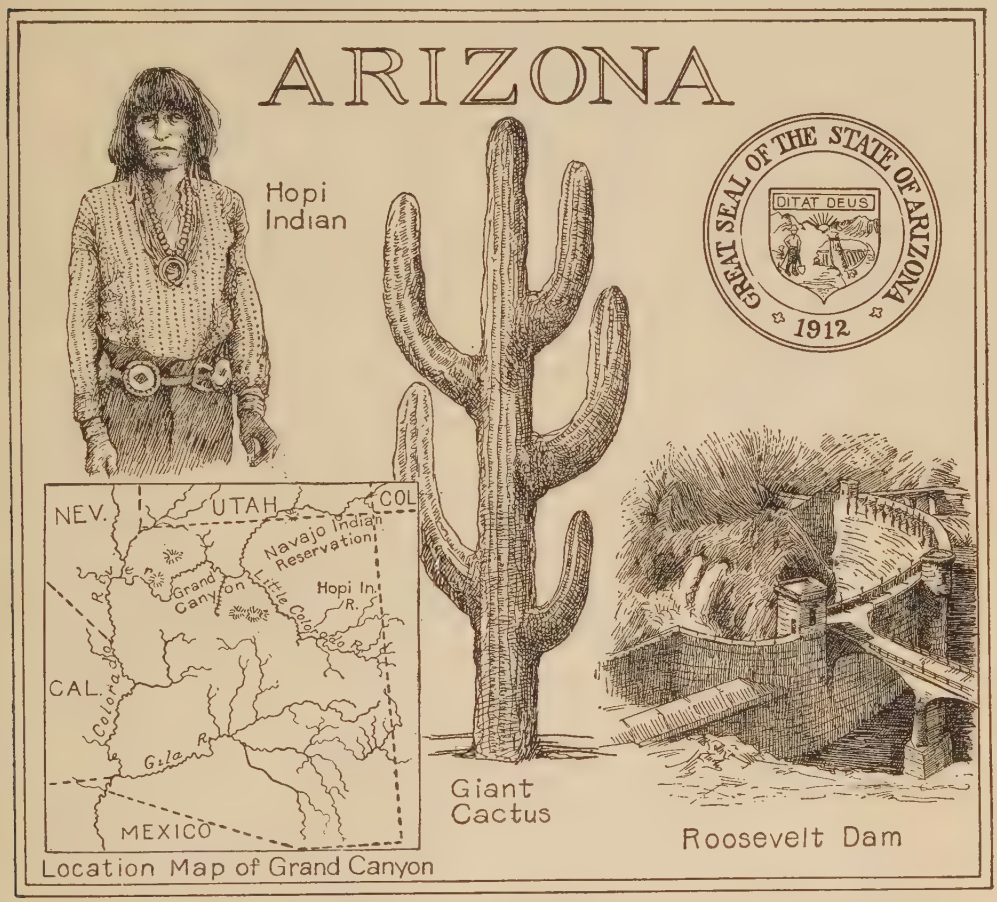
The southwestern part slopes from the central mountain ranges toward the Gila River, which flows across the southern portion. Its general elevation is lower than that of the northern and northeastern portions, and it is marked by occasional buttes and mesas, which rise abruptly from the plains. Most of the southern half is noted for its desertlike appearance. The Gila has a few shallow tributaries, but, save for underflow, they are dry a large part of the year.

Climate. The climate is unusually dry and healthful. The elevation of the northern half of the territory gives a mean annual temperature of about 45°. The southern half is intensely hot during the summer, and has a mean annual temperature of about 70°. Throughout the state the rainfall is light. In the northern half it averages about twenty inches annually, but in the southern half only eight or ten inches. For this reason vegetation is scant and consists largely of bunch grass, various species of cactus, mesquite, greasewood and other forms which are common to arid regions. In the regions above 5,000 feet, in the northern and southern sections, are valuable pine forests.

Mineral Resources. Arizona is rich in minerals, and for many years has been the seat of mining occupations. Gold, silver, copper, coal, lead and stone valuable for building and ornamental purposes exist in large quantities, but as yet mining opera-

tions have been confined to gold, silver, lead, zinc and copper. The copper industry is by far the largest, and Arizona ranks as the first state in the production of this metal, being approached only by Montana (see COPPER). Gold, silver, lead, zinc and copper add about $220,000,000 to the wealth of the state every year. Some of the mines in this region have been worked since the time of the early Spanish occupation of Mexico.

Agriculture. Lack of moisture has restricted agriculture to stock raising in those regions where grazing is possible and to intensified farming in the irrigated districts. Sheep and cattle are raised in large numbers, and Arizona is one of the leading states in the production of wool. Along the valley of the Gila River and on some of its tributaries irrigation has been practiced with great success. Here citrus fruits, olives, grapes and



In the northeastern part, near Holbrook, is found a remarkable collection of petrified trees, known as the petrified forest. The rock thus formed takes a high polish, presents a beautiful variegated appearance and is highly valued for ornamental purposes. Precious stones, including the opal, the garnet and the sapphire, are also found, and there are valuable quarries of onyx and marble, though these have not yet been worked to any extent.

other products common to a semitropical region are raised with little effort. Alfalfa is also an important crop. The agricultural products are worth over $40,000,000 a year.

Irrigation is also practiced around Phoenix with especial success; the Roosevelt Dam, constructed by the government and completed in 1911, impounds water sufficient to irrigate more than 200,000 acres. It is estimated that Arizona has between 1,000,000 and 2,000,000 acres which can be irrigated with profit.

Items of Interest on Arizona

In the northwestern part of the state is the Grand Canyon of the Colorado River, one of the natural wonders of the world; it is from five to six miles wide at the top and from 5,000 to 6,000 feet deep.

Along the Colorado, in the northern part of the state, is the Painted Desert, noted for the bright reds, browns, blues and yellows of its sandstones and clays.

The petrified forest in the same region is the most remarkable in the United States; blocks and logs of agate, jasper, opal and other silicate deposits lie in hundreds over an area of sixty square miles.

Many of the mountains are extinct volcanoes.

Floods come in May and June when the rivers are almost choked by alluvial matter; many of the streams are normally dry gulches.

A part of the Mexican boundary runs through a true desert.

The temperature is generally higher than that of other states in the same latitude; the hottest part is the lower Gila Valley, where the mean for the hottest month is nearly 100 degrees Fahrenheit and the maximum nearly 130 degrees; fortunately the dryness and clearness of the air allows such rapid radiation that the temperature often falls to forty or fifty degrees at night.

Within the borders of Arizona are areas representing almost every plant and animal zone; from the summit of the San Francisco Mountains down into the Painted Desert the traveler may pass through them all.

There are over seventy-five different species of cactus.

Continuous forest areas are few, but clumps and thickets of cottonwood, sycamore, ash, willow and walnut grow in the canyons; practically all the mountainous areas have some forest growth.

Nearly ninety per cent of the forest area is now included in reservations.

There are numerous large ostrich farms, with over 6,000 birds in the Salt River Valley.

Onyx, marble and a few precious stones, such as garnet and turquoise, are found in considerable quantities.

The rugs and blankets made by the Navajo and Moki (or Hopi) Indians are famous.

The percentage of illiteracy is high, being over twenty per cent of native males above twenty years of age and over thirty per cent of foreign born males.

The first juvenile reform school was opened in 1903 at Benson; juvenile and probation courts for child offenders were established in 1907.

The state has many valuable and interesting ruins of former civilizations; the most noted of the ruins is the Casa Grande, the only one of its type in the United States, a large building of rooms, courts and plazas surrounded by a wall of sun-dried clay.

The area north of the Gila River was ceded by Mexico to the United States at the close of the Mexican War; the strip south of the Gila, known as the Gadsden Purchase, was bought in 1854.

Questions

What is the area of Arizona?

Where is the highest point in the state?

Where is the Grand Canyon?

Name three of the important rivers.

What is the petrified forest? Where is it?

In a general way characterize the climate of Arizona.

How are the Gila and Colorado rivers fed?

How many species of cactus are found?

Where is the Roosevelt Dam? How large is it? How many acres of land will be irrigated by the water which it stores? When and by whom was it formally dedicated?

Name three other minerals found in the state.

Who were the Cliff Dwellers?

When and how was the area now included in Arizona acquired by the United States?

Within recent years, especially since 1910, the raising of dates has been a promising new industry, particularly in the Salt River Valley. Only a few thousand pounds have been marketed as yet in any one year. In 1917 the experiment station of the state produced 22,000 pounds.

Transportation. The Colorado River is navigable. The Southern Pacific Railroad crosses Arizona from east to west in the southern part, with important branches to Globe, Nogales (connecting with the great west coast system in Mexico), and to Phoenix and Winkelman; the Santa Fe system crosses the northern part, with branch lines to the Grand Canyon from Williams, to Prescott and Phoenix from Ashfork, and westward from Phoenix to the Colorado at Parker and to Los Angeles; and the El Paso & Southwestern system extends from Benson on the Southern Pacific southeast to Bisbee, Douglas and El Paso, with connections into Mexico. The settled portions of Arizona are along these railroads, which furnish excellent direct connections with the Pacific coast and with the centers of trade in the east and northeast. In all there are about 2,450 miles of railroad in the state.

Education. Arizona maintains a thoroughly organized system of public schools. The University of Arizona is at Tucson, and there are normal schools at Tempe and Flagstaff. The enrollment in the public schools is more than 70,000, and the expenditures for maintenance about $2,250,000 per year.

Institutions. The asylum for the insane is located at Phoenix; the prison is at Florence; the Home for Aged and Infirm Arizona Pioneers, at Prescott, and a Children's Home, at Phoenix.

Cities. In 1917, according to Federal estimates, Arizona had but two cities with populations exceeding 10,000; these were Phoenix, the capital (19,445) and Tucson (17,324). Bisbee had a population of 9,019 in 1910; its later growth is slight.

Government. The elective state officers are governor, secretary of state, auditor, treasurer, attorney-general and superintendent of public instruction. The term of office is two years; the treasurer is limited to one term.

The legislature is composed of a senate of nineteen members and a house of representatives of thirty-five members. The initiative, referendum and recall are in force.

History. Arizona was first visited by the Spaniards in 1539, but it had long been the seat of a race of natives whose ruins of villages and fortifications still remain. The hostility of the Indians retarded settlement, and revolutionary disorders in Mexico in the first half of the 19th century led to the abandonment of most of the mines and settlements except Tucson and Tubac. The territory was acquired at the close of the Mexican War by the treaty of 1848, and by the later treaty of 1853. It was governed as a part of New Mexico until 1863, when it became an independent territory. Frequent Indian uprisings, especially of the Apache, greatly interfered with development, the last one occurring in 1896.

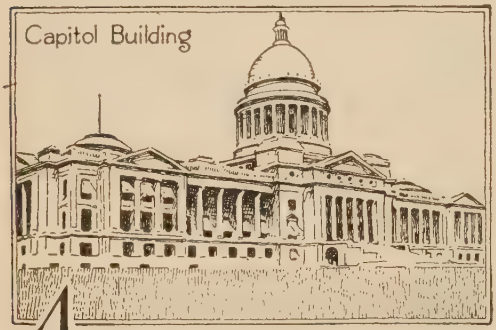
With the extension of railroads into Arizona, the growth of great mining centers and the opening up of irrigated lands, progress has been rapid. As a consequence, demands for the admission of the territory as a state have been insistent, and in 1910 an enabling act was passed by Congress. The state was admitted February 14, 1912. Full suffrage is granted to women on same conditions as to men. In 1914 the state declared for statewide prohibition, the law declaring that intoxicating liquors "shall not be manufactured or introduced into the state of Arizona under any pretense." There is also a provision for mothers' pensions (which see). In 1919 capital punishment was reinstated as the penalty for first-degree murder.

Related Articles. Consult the following titles for additional information:

Apache
Arizona, University of
Bisbee
Butte
Cliff Dwellers
Colorado River
Gadsden Purchase
Gila (river)
Grand Canyon of the Colorado
Hopi
Irrigation
Mesa
Mohave
Navaho
Phoenix
Prescott
Pueblo
Tucson

ARIZONA, UNIVERSITY OF, the only institution of college rank in Arizona, is a coeducational university, established by an act of the legislature in 1885, and is located at Tucson. It has about 500 students regularly enrolled, and a faculty of over sixty. The departments include the college of letters and arts, the School of Mines, the Agricultural and Mechanical College, the Agricultural Experiment Station and a preparatory department. The library contains 22,000 bound volumes. The income of the university amounts to about $538,680 per year.

ARK, a word applied in the Bible to three objects: (1) The vessel in which Noah, his family and various animals were preserved during the flood (*Gen.* VI). It was built of gopher wood (probably cypress), and the pitch was doubtless asphalt. (2) The basket of bulrushes which the mother of Moses made to preserve her infant son from death (*Exod.* II). (3) The Ark of the Covenant, an article in the Tabernacle and afterward in Solomon's temple at Jerusalem (*Exod.* XXV, 10–22; XXVII, 1–9).



ARKANSAS, *ahr'kan saw*, popularly known as THE BEAR STATE, is one of the south-central group of states, with the Mississippi River as its eastern boundary. Missouri is north; across the great river are Tennessee and Mississippi; on the south is Louisiana; Oklahoma and a little of Texas are on the west. The area is 53,335 square miles, of which 810 are water. In size Arkansas is the twenty-sixth state and in population in 1910 the twenty-fifth. In that year the state had 1,574,449 people, an average of thirty to the square mile, practically the same average as the United States as a whole; in 1917 a Federal estimate credited it with a population of 1,766,343. The state is nearly a square, about 250 miles in length and breadth.

Surface and Drainage. The part of the state bordering on the Mississippi is low and marshy, but with occasional high bluffs. The surface rises to the westward in the central portion, where undulating features are found. Beyond these to the west and northwest is a region crossed by numerous ranges of hills and low mountains, having a general trend from east to west. Spurs of the Ozark Mountains occur in the northwestern part of the state. The most important range is known locally as the Boston Mountains. South of these are the Ouachita Mountains. All the ranges are low, the highest point not exceeding 2,820 feet. They are a continuation of the elevation in Oklahoma on the west and Missouri on the north.

The Arkansas River divides the state into two nearly equal divisions, and with the exception of two ranges of hills extending south and west through the central and western portions, all that part of the state south of this river consists of lowland. The other important streams are the White, flowing southward through the northeastern part and entering the Mississippi just above the Arkansas; the Black and Cache, which are important northern tributaries of the White; the Saline, which drains the southwestern portion, and the Ouachita, which drains the south-central portion. There are numerous marshes and bayous along the Mississippi, but the state contains no lakes of importance. The fertile lowlands along the Mississippi are protected by an extensive system of dykes or levees (see LEVEE). But notwithstanding this protection, some of these lowlands are subject to overflow during periods of high water. This, however, does not prevent their occupation for agricultural purposes.

Climate. The lowlands have a hot and, in a few sections, unhealthful climate, but the northern and northwestern part, especially in the mountainous and hilly region, has a very mild and pleasant climate. This region is not subjected to severe north winds or to long drought. Because of this, the Ozark region of Arkansas has attained a wide reputation as being beneficial to persons afflicted with lung diseases. Hot Springs, in Garland County, is one of the most popular health resorts in the world. The annual rainfall of the state ranges from forty inches in the north to fifty-five inches in the south.

Minerals. Arkansas takes first rank among the states in the production of bauxite, the ore of aluminum; its output is worth (1918) over $2,200,000. Its chief mineral, however, is coal; production is constantly increasing, being one-third greater in 1918 than in 1917 and netting the mines fifty per cent more. Next to coal in importance is lead and zinc. Last among the mining products of importance is manganese, whose annual value at the mines in 1918 was over $200,000, which was twenty times its value in 1915. There are deposits of marble, slate, granite and valuable stone for hones, and

ARKANSAS
THE BEAR STATE
STATE FLOWER
RICE
FAYETTEVILLE
PARAGOULD
FORT SMITH
LITTLE ROCK
HOT SPRINGS
HELENA
PINE BLUFF
TEXARKANA
THRESHING RICE
PEACHES
APPLES
STRAWBERRIES
GRAPES
PEARS
MELONS
POULTRY
RICE FIELD
COTTON
TOBACCO
POTATOES
BALING HAY
COAL TIPPLE
MARBLE QUARRY
SHEEP
SAWMILL
TOMATOES
GRANITE
COWS
CORN
ENTRANCE TO HOT SPRINGS
FOREST
HORSES

within recent years considerable prospecting for oil and gas has been done. No oil has yet been discovered in paying quantities, but a very considerable gas field has been developed near Van Buren, in the western part of the state, some of the wells producing as high as 20,000,000 cubic feet per day.

Agriculture. Arkansas is almost exclusively an agricultural state, and more than half of its area is in farms. North of the Arkansas River and in the higher altitudes grains, including wheat and corn, and fruits common to the temperate latitudes are grown. The northwestern portion of the state has attained a wide reputation for the excellent quality of its apples, peaches and strawberries. In the northeastern portion the soil is light and sandy and not very productive. Along the lowlands of the Mississippi and in the bottom lands south of the Arkansas lies the cotton belt, which yields the largest crops of any section of the state under tillage. Cotton is the most important crop, and Arkansas now ranks as the fifth state in the production of this staple, the value of the annual crop before the increase in price resulting from the World War being over $55,000,000. In 1918 the crop was worth more than twice that amount. Livestock is raised in considerable quantities in the northern and northwestern sections, but stock raising is not one of the leading industries.

The second crop in value is corn, and its acreage is larger in average years than that given to any other crop except cotton. It adds about $100,000,000 to the wealth of the state every year. Next in value are rice, oats and wheat.

Transportation. The Mississippi gives the eastern portion of the state ready access to the sea and to all states with which the Mississippi is connected by navigable tributaries. The Arkansas is navigable across the entire state, and the Ouachita, in its lower course, for about two-thirds of the year. During high water the Saint Francis, Black and White rivers are also navigable. These streams greatly facilitate transportation and assist commerce. Important railway lines extend across the state from northwest to southwest and from east to west. While railroad building in Arkansas has not been as extensive as in some other states, there are more than 6,000 miles of lines. The commerce of the state finds an outlet through Memphis and New Orleans. The exports are cotton, lumber and the products of the various mines and quarries, while the imports are manufactured articles and such food products as are not grown within the state.

Education and Religion. In 1917 a compulsory education law was passed, affecting children between the ages of seven and fifteen years. Parents may choose the kind of school their children shall attend. Nearly half a million boys and girls are between the ages named. Illiteracy in 1910 was 12.6 per cent, a decrease from 20.4 per cent in 1900.

The state university, which includes the college of agriculture and the agricultural experiment station, is located at Fayetteville. The medical college is at Little Rock, and the branch normal college for negroes is at Pine Bluff. There is a state normal school at Conway, and there are state agricultural schools at Monticello, Jonesboro, Russellville and Magnolia. In 1917 the legislature passed an act levying a special tax on all the property of the state for the support of all the state educational institutions. Arkansas was the first state in the South to take this action.

Most of the people of Arkansas who attend church support the Baptist and Methodist denominations; nearly half of all church members are Baptists, and about one-third are Methodists.

Institutions. At Little Rock, the capital, are the state penitentiary, the reform school, the deaf mute institution, the school for the blind and the state hospital for nervous diseases. A confederate soldiers' home is at Sweet Home.

Cities. According to Federal estimates of 1917 Arkansas in that year had six cities with populations exceeding 10,000. These were, in order of size, Little Rock, the capital (58,716), Fort Smith (29,390), Pine Bluff (17,777), Hot Springs (17,690), Argenta (15,515) and Helena (11,122).

Government. The state officers are governor, secretary of state, treasurer, fire marshal and insurance commissioner, attorney-general, superintendent of education, commissioner of agriculture and commissioner of public lands. The elective officers are chosen for two years.

The legislative department consists of a senate of thirty-five members, chosen for four years, and a house of representatives

Items of Interest on Arkansas

The general surface of Arkansas is an inclined plane, with a gentle slope from north to south or southeast.

In the western part of the state is Mount Magazine, with an altitude of 2,820 feet, the highest elevation in the state, and said to be the highest point between the Rockies and the Alleghenies.

The uplands constitute about two-fifths of the area of the state.

Arkansas has more miles of navigable waterways in proportion to its area than any other state in the Union.

Arkansas has numbers of springs which have so great a flow that they furnish power for operating mills and factories; Mammoth Spring, in Fulton County, is the largest and best known in the state.

The forest area of Arkansas is greater than the total area of Indiana.

One hundred thirty kinds of trees are found in this state.

The Arkansas National Forest has an area of 1,073,000 acres.

The stand of pine in Arkansas is estimated to be about thirty billion feet.

At the time of the Louisiana Purchase there were less than three hundred white people in the area now included in Arkansas.

In the upland regions, where there is a good subsoil, all cereals are successfully grown.

Large crops of hay and alfalfa are grown, especially in the valleys of the Red and White rivers.

Apples, peaches, strawberries, watermelons and cantaloupes are grown in large quantities for shipment to the great markets of the country.

Among other crops the most important are potatoes, onions, cabbages; various kinds of nuts, especially peanuts, pecans, walnuts, filberts and hazelnuts are a valuable product.

The most important manufacturing industry is the making of lumber and lumber products: the saw and lumber mills of the state represent a total investment of $25,000,000, and the annual value of the products is not less than $40,000,000.

Flour and grist milling is second in importance to lumber manufacture.

The manufacture of cottonseed oil and cotton-cake is growing in importance.

The manufacture of pearl buttons from mussel and clam shells is a growing industry.

The production of coal is the most important mining industry in the state.

Zinc and lead are mined in large quantities; and valuable deposits of manganese and antimony have been found in various parts of the state.

Building stones, including blue and gray granite, marble, limestone, slate and chalk, are among the most important mineral resources.

A block of marble shipped to Washington to be used in the Washington Monument is said to be the first piece of marble shipped out of the state.

Questions on Arkansas

What is the area of Arkansas? How does it compare with that of Texas?

What can you say of the surface and the river systems of the state?

What is the average temperature? The average rainfall?

What are the chief mineral products?

What is the leading manufacturing industry?

What is the average annual value of the products?

Name some other important manufactures.

What is the most important agricultural crop?

How long has rice been an important crop?

What are the most important fruits raised in Arkansas?

What is the capital of the state? Is it of any other importance?

Why are the following cities noteworthy: Fort Smith, Fayetteville, Hot Springs, Texarkana?

of 100 members, whose term is two years. Sessions are limited to sixty days.

The right of suffrage is restricted to those who have resided in the state a year, in the county six months and in the precinct or ward one month, and who have paid a poll tax; This law was passed in 1893.

History. The first settlement in the territory of Arkansas was by the French, at Arkansas Post, in 1685, and little advance was made until the territory came into the possession of the United States by the Louisiana Purchase in 1803. It was governed as a part of the Territory of Louisiana until 1812; as a part of the Territory of Missouri until 1819; as an independent territory, including Indian Territory, until 1836, when the present state was formed. At the outbreak of the Civil War the state was about evenly divided on the question of secession, but changing conditions led the state to secede on May 6, 1861.

It adopted a new constitution, prohibiting slavery, in 1864, but was not re-admitted until 1868, delay being caused by the congressional policy of reconstruction. Another constitution was adopted in 1874, and this one is now the basic law of the state. In 1910 the initiative and referendum was adopted. The legislature in 1917 adopted a "bone dry" prohibition law, thus putting itself on record a year ahead of the Federal amendment, and it conferred upon women the right to vote at primary elections.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

Argenta
Fort Smith
Helena
Hot Springs
Little Rock
Mississippi River
Ozark Mountains
Pine Bluff
Red River
Texarkana
Washita River
White River

HISTORY

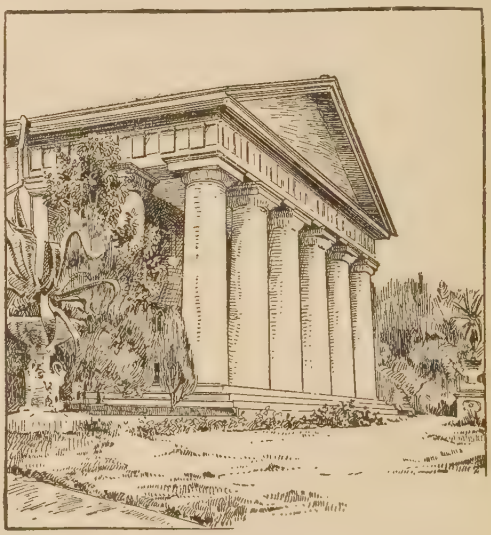
Carpetbaggers
Louisiana Purchase
Reconstruction

ARKANSAS, a river of the United States, rising in Colorado and flowing through Kansas and Oklahoma and across Arkansas into the Mississippi River. It is the largest tributary of the Mississippi excepting the Missouri. Its length is about 2,100 miles, it is navigable for about 650 miles, and it drains an area of 188,000 square miles. In its upper course in Colorado, it flows through the Royal Gorge, one of the most remarkable canyons in the country. The water in its upper course is utilized for navigation.

ARKANSAS, an Indian tribe. See QUAPAW.

ARKANSAS, UNIVERSITY OF, a state institution established in 1872. The academic and technical departments are located in Fayetteville; the law and medical departments in Little Rock, and the Normal School, which is for colored students, at Pine Bluff. The combined schools have a student enrollment of about 860 and a faculty of over 125.

ARKWRIGHT, SIR RICHARD (1732–1792), an English inventor, born at Preston, Lancashire. His early education was very meager, and at the age of thirteen he was apprenticed to a barber. From living in a place where cotton-spinning was the chief industry, he early became interested in the processes used in cotton manufacture. At that time cloth was made with a linen warp, as no way had been found to spin cotton fit for a warp. Arkwright invented a spinning jenny that transformed the cotton rolls from the carding machine into fine, hard-twisted thread, suitable for warp. His first machine was set up at Preston, but he was obliged to leave this place on account of the prejudice of the spinners against such a labor-saving machine, and he moved to Nottingham. In 1769 he set up his first mill and later built a larger factory. Arkwright may be called the founder of the modern factory system. See SPINNING; COTTON; FACTORY AND FACTORY LEGISLATION.



THE LEE MANSION AT ARLINGTON

ARLINGTON NATIONAL CEMETERY, a beautiful burying ground in Virginia, occupying the site of the former estate of

Robert E. Lee. During the Civil War the estate was seized by the Federals, and was eventually made a national cemetery. The family mansion of the Lees, a stately example of colonial architecture, is now a museum of historic relics. The beautiful grounds of the cemetery surround it, and back of it is a magnificent oak forest. The national cemetery is the resting place of soldiers and sailors of the Revolution, the War of 1812, the Seminole, Mexican, Civil and Spanish-American wars, the Filipino insurrection, and the Boxer rebellion, and in the days to come there will sleep in Arlington many of the heroic dead of the great World War.

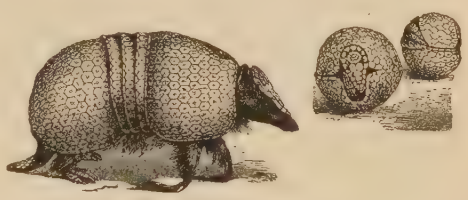
The burying ground lies near the village of Arlington, Va., three miles from Washington, D. C. Tourists can make the trip by electric car or by automobile.

ARM, the upper limb of the human body. though some authorities call that part of the limb which is between the wrist and elbow the *forearm,* and apply the term *arm* to the portion above the elbow, this distinction is not usually made in ordinary speaking or writing. Because the arm is in such constant use, and is so necessary to man in connection with all his activities, it is provided with muscles that move it in various directions. Above the elbow are the biceps for bending it, and the triceps for stretching it out again. Other muscles enable one to place the arms across the chest, to draw them backward and to lift them above the head. In the forearm there are muscles for bending and extension, and for controlling the movement of the hand. See BICEPS.

ARMA'DA, the Spanish name for any large naval force, usually applied to the fleet designated the *Invincible Armada,* assembled to act against England in 1588. It was fitted out by Philip II, partially to avenge the death of Mary Queen of Scots, and consisted of 130 war vessels, with over 19,000 soldiers and 8,000 sailors, all under the command of the Duke of Medina Sidonia. The fleet had scarcely quitted Lisbon, on May 29, 1588, when it was shattered by a storm, and had to be refitted in Coruna. It was to coöperate with a land force collected in Flanders under the Prince of Parma, and, to unite with this, it proceeded through the English Channel toward Calais.

In its progress it was attacked by the English fleet under Howard, Drake, Hawkins and Frobisher, and the great lumbering Spanish vessels suffered severely from their smaller opponents, which eluded most of the Spanish fire. Driven close to Gravelines, the Armada was becalmed and was thrown into confusion by fire-ships. The Duke of Medina Sidonia, owing to his severe losses, at last resolved to abandon the enterprise, and conceived the idea of reconveying his fleet to Spain by a voyage round the north of Great Britain; but storm after storm assailed his ships, scattering them in all directions and sinking many. Some went down on the cliffs of Norway, others in the open sea, others on the Scottish coast. Only about fifty vessels arrived again in Spain.

ARMADIL'LO, a toothless mammal, found in South America. Armadillos are covered with a hard, bony shell, divided into belts, and composed of small separate plates like those of a coat of mail. The shell is flexible except on the forehead, shoulders and haunches, where it is not movable. The belts



ARMADILLO

are connected by a membrane, which enables the animal to roll itself up like a hedgehog. These animals burrow in the earth, where they lie during the daytime, seldom going abroad except at night. They are of different sizes, the largest being three feet in length, not including the tail, and the smallest only ten inches. They subsist chiefly on fruits and roots, sometimes on insects and flesh. They are inoffensive and their flesh is esteemed as food. Armadillos are sometimes known as ant-eaters (see ANT-EATER).

ARMAGED'DON, a name used in the Bible to designate the place where sin and righteousness will, on the Day of Judgment, fight their last battle (see *Revelation* XVI, 16). The word is sometimes used as a symbol of any decisive conflict, and was a rallying cry of the Progressive party in the campaign of 1912.

AR'MATURE, a term applied to the piece of soft iron which is placed across the poles of permanent or electro-magnets for the pur-

pose of receiving and concentrating the attractive force. In the case of permanent magnets, it is also important for preserving their magnetism when not in use, and hence is sometimes termed the *keeper*. It produces this effect by virtue of the well-known law of induction, by which the armature, when placed near or across the poles of the magnet, is itself converted into a temporary magnet with reversed poles, and these, reacting upon the permanent magnet, keep its particles in a state of constant magnetic tension. A horseshoe magnet should therefore never be laid aside without its armature; and, in the case of straight-bar magnets, two should be placed parallel to each other, with their poles reversed, with a keeper or armature across them at both ends. The term is also applied to the core and coil of the electro-magnet, which revolves before the poles of the permanent magnet in the magneto-electric machine. See MAGNET; ELECTRO-MAGNETISM.

ARME'NIA, an ancient Christian kingdom, important enough in the days of Alexander the Great to arouse his desire for possession. Since then it has been the victim of successive exploitations by the Persians, Arabs and Turks, with occasional respite from mistreatment as a result of the interference of Christian powers. Armenia is a land of sorrow, its people more persecuted than those of any other nation; while owing forced allegiance to non-Christian rulers, they have through the centuries adhered to the faith of their fathers, though millions have suffered torture and massacre.

Location and Resources. The boundaries of Armenia have varied at different times,

HISTORICAL ARMENIA

but at the outbreak of the World War (1914) the name was applied to a region in Western Asia including the northeast corner of Asiatic Turkey, the southern part of Transcaucasia (Russian Armenia) and the northwest corner of Persia. The greater part of Armenia, however, covering about 72,000 square miles, belonged to Turkey, and it is Turkish Armenia that has come to be a symbol for untold suffering. Travelers often noted the difference between the people in Russian Armenia and those under Turkish rule. The former were permitted opportunities for development; the latter were enslaved.

Armenia is in every way well adapted to agriculture. It has fertile corn lands and broad pastures, and its valleys produce cotton, rice, tobacco, grapes and dates. Because of constant ill-treatment of the people the land has not produced to the extent of its possibilities. In the forests are found the ash, maple, oak, walnut, chestnut and pine. There are no manufacturers of great importance. The country is rich in minerals, which include silver, lead, iron and copper.

The People. The Armenians belong to the Aryan branch of the human family. They naturally have keen intellects, and under favorable conditions become prosperous in business enterprises and in the professions. Those kept under Turkish rule have usually remained in dense ignorance. Before the World War the population of Turkish Armenia (the chief city of which is Erzerum) was estimated at about 2,470,000; the Armenians numbered about 650,000, the remainder being Kurds and Turks. In European Turkey there were about 500,000 Armenians, and in Asiatic Turkey outside of Armenia about 576,000. There were over 1,000,000 in Russian Transcaucasia, and many thousands were scattered over the world. The plight of the hapless subjects of the Turkish sultan during the World War aroused the indignation of the civilized world. In 1917 the American Committee for Armenian and Syrian Relief reported that—

> . . . close to 1,200,000 out of the 1,800,000 Armenians who had been in the Turkish Empire two years before had been either massacred or deported. Those who were massacred had often suffered the most extreme tortures, and those who had been deported had been the victims of the greatest hardships, many dying from starvation, disease and exhaustion. They were driven in troops through the swampy regions and deserts of

the middle Euphrates, where many died of exhaustion and many, when they were unable to march further, were massacred by their captors.

History. Armenia was the Ararat of the Scriptures, and the Urartu of the Assyrians, by whom it was conquered as early as the eighth century. It was conquered by Alexander the Great in 325 B. C., and for the next one hundred and fifty years was subject to the Macedonians or Syrian-Greeks. It regained its independence about 190 B. C., when it was divided into Armenia Major and Armenia Minor, each administered under a separate government. Under Tigranes the Great, son-in-law of Mithridates, the country was conquered by the Romans in 69 B. C. and was made a tributary province. In the latter part of the fourth century, it was partitioned between Persia and the Byzantine Empire.

The old religion of the country was Zoroastrianism. Christianity was introduced in 285 by Gregory the Illuminator. The new creed rapidly gained ground, and the Armenians are accredited with establishing the first Christian church in the world. The attempt of the Persian rulers to overthrow Christianity plunged the country into war and anarchy, but the Armenians held to their faith. Three hundred fifty years later the Arabs secured control of the country, and the next two and a half centuries were marked by conflicts between the Christians and Mohammedans. After the latter half of the ninth century, the country enjoyed a period of tranquillity which lasted for one hundred years. Armenia was invaded in succession by the Byzantines, Mongols and Seljuk Turks, and it was finally divided between the Byzantines and Timur. In 1472 it was conquered by the Persians, and in 1828 a portion of that under Persian control was seized by Russia. The ancient kingdom was finally divided among Turkey, Russia and Persia. By the treaty of 1878 (see BERLIN, CONGRESS OF), the powers of Europe guaranteed the integrity of the Turkish Empire, and after that time the conditions of Armenia remained unchanged until the close of the World War.

In 1885 the Armenians attempted a revolutionary movement to secure freedom from growing oppression, but were put down by the Kurds or Turkish soldiers, with the greatest cruelty. Frequent massacres have occurred since that time, and in 1895–1896 the suffering of the people aroused the humane nations of the world. A joint commission was sent to Constantinople to remonstrate with the Turkish government. Reforms were promised, but they were never carried out, though the indiscriminate massacres were less frequent for a time.

The collapse of the Teutonic alliance and the full surrender of Turkey to the allies in the fall of 1918 brought new hope to the remnant of the Armenians. The boundaries and status of the Armenian state were left to the determination of the League of Nations, but it was expected that an autonomous state would be erected, either fully independent or under the protection of one or more of the allied nations. See WORLD WAR.

ARMIN'IUS (18 B. C.–about A. D. 20), the chief of a German tribe, celebrated as the deliverer of his country from the Roman yoke. He completely annihilated the army of Varus, consisting of three legions, in a three days' battle fought in the Teutoburg forest (A. D. 9). After many years' resistance to the power of the empire, he drew upon himself the hatred of his countrymen by aiming at the regal authority and was assassinated.

ARMISTICE, *ahr'mis tis*, a mutual agreement to suspend hostilities, between two armies or nations at war. It is generally proposed when an endeavor to form a treaty of peace is being made, and sometimes when both parties are exhausted. The desire for an armistice for a temporary purpose—such as to bury the dead after a battle—is indicated by the hoisting of a white flag. The last armistice in history was the one sought by the Germans in 1918, after over four years of the most awful war the world has ever witnessed. Had not Germany taken this action at the time it did, the allied forces opposing that country within ten days would have annihilated the remaining German forces or caused their unconditional surrender on German soil. See WORLD WAR.

ARMOUR, an American family prominent in the meat-packing industry.

Philip Danforth Armour (1832–1901), was one of the founders of the largest pork-packing establishments in the world. He was born at Stockbridge, N. Y. In 1856 he became a wholesale grocer in Milwaukee, Wis., and seven years later became head in that city of the packing firm of Armour, Plankington & Co. In 1870 the main office

of the rapidly-expanding organization was removed to Chicago, where the present organization of Armour & Co. took shape. When Armour died his firm possessed more grain elevators than any other company in the world. The founder of the great organization was a noted philanthropist, and generously endowed the Armour Institute of Technology and the Armour Mission, both in Chicago.

Jonathan Ogden Armour (1863–), son of Philip D. Armour, and his successor as head of Armour & Co., was born in Milwaukee, Wis. He showed the same business ability as his father, and became a director of several large banks and commercial corporations. In 1906 he wrote *The Packers, The Private Car Lines,* and *The People.*

ARMOUR INSTITUTE OF TECHNOLOGY, a technical institution of collegiate rank, established in Chicago, by Philip D. Armour, in 1893. Its entrance requirements are as high as those of the best American universities and colleges, and it offers courses leading to the degrees in general science, architecture, mechanical, mining, electrical, chemical and civil engineering. Its faculty numbers about sixty, and it has nearly 1,500 students, including those in the preparatory school.

ARMS and ARMOR. ARMS. This is a term applied to weapons used in defensive and offensive fighting, and carried by the soldier. Machine guns and other weapons of that class come under the head of *artillery* (which see). Important among modern arms are rifles, bayonets, swords and lances, all of which were used by the soldiers who fought in the World War. Swords, as well as revolvers or pistols, were formerly carried by the officers, but the sword has been largely abandoned. The infantry used only rifles and bayonets; the cavalry had lance, sword, rifle or carbine. The bayonet, which played a very important part in hand-to-hand fighting in the World War, is the most recently invented of weapons not classed as firearms.

The first arms were probably wooden clubs, and these were followed by wooden weapons made more deadly by means of stone or bone, stone axes, slings, bows and arrows with heads of flint or bone, and afterward various weapons of bronze. Subsequently, iron and steel arms of various kinds were introduced, comprising the sword, javelin, pike, spear or lance, dagger, axe, mace and chariot scythe. The lance, spear and javelin were the principal weapons of the Homeric age among the Greeks. The bow is not often mentioned. Among ancient nations the Egyptians seem to have been most accustomed to the use of the bow, which was the principal weapon of their infantry. Peculiar to them was a defensive weapon intended to catch and break the sword of the enemy. With the Assyrians the bow was a favorite weapon; but with them lances, spears and javelins were in more common use than with the Egyptians.

During the historic age of Greece the characteristic weapon was a heavy spear from twenty-one to twenty-four feet in length. The sword used by the Greeks was short and was worn on the right side. The Roman sword was from twenty-two to twenty-four inches in length, straight, two-edged, and obtusely pointed, and, as by the Greeks, was worn on the right side. It was used principally as a stabbing weapon. It was originally of bronze. The most characteristic weapon of the Roman legionary soldier, however, was the *pilum,* which was a kind of pike or javelin, six feet or more in length. The pilum was sometimes used at close quarters, but more commonly it was thrown. The favorite weapons of the ancient Germanic races were the battle-axe, the lance or dart and the sword. The weapons of the Anglo-Saxons were spears, axes, swords, knives and maces or clubs. The Normans had similar weapons, and were well furnished with archers and cavalry. The cross-bow was a comparatively late invention, introduced by the Normans. Gunpowder was not used in Europe to discharge projectiles till the beginning of the fourteenth century. Most of the weapons mentioned are described in these volumes under separate headings.

Armor. Some kind of defensive covering was probably of almost as early invention as weapons of offense. The principal pieces of defensive armor used by the ancients were shields, helmets, cuirasses and greaves. In

the earliest ages of Greece the shield is described as of immense size, but in the time of the Peloponnesian War (about 420 B. C.) it was much smaller. The Romans had two sorts of shields; the *scutum*, a large, oblong, rectangular, highly convex shield, carried by the legionaries; and the *parma*, a small, round, or oval, flat shield, carried by the light-armed troops and the cavalry. In the

ARMOR
1, 2, Early Greek; 3, Greek; 4, 5, Roman; 6, Barbarian.

declining days of Rome the shields became larger and more varied in form. The helmet was a characteristic piece of armor among the Assyrians, Greeks, Etruscans and Romans. Like all other body armor, it was usually made of bronze. The helmet of the historical age of Greece was distinguished by its lofty crest. The Roman helmet in the time of the early emperors fitted close to the head, and had a neck-guard, hinged cheek-pieces fastened under the chin, and a small bar across the face for a visor. Both Greeks and Romans wore cuirasses, at one time of bronze, but latterly of flexible materials. Greaves for the legs were worn by both, but among the Romans usually on one leg only.

The ancient Germans had large shields of plaited osier covered with leather; afterward their shields were small, bound with iron and studded with bosses. The Anglo-Saxons had round or oval shields of wood, covered with leather, with a boss in the center; and they had also corselets, or coats of mail, strengthened with iron rings. The Normans were well protected by mail; their shields were somewhat triangular in shape; their helmets conical. In Europe generally, metal armor was used from the tenth to the eighteenth century, and at first consisted of a tunic made of iron rings firmly sewed flat upon strong cloth or leather. The rings were afterward interlinked one with another so as to form a garment of themselves, called *chain-mail*. Great variety is found in the pattern of the armor, and in some cases small pieces of metal were used instead of rings, forming what is called *scale-armor*. Larger pieces of metal were fastened together to make *plate-armor*, which gradually superseded the other forms and continued to be worn until long after the introduction of firearms and field artillery. A complete suit of armor was an elaborate and costly equipment.

In modern warfare the most conspicuous survival of the medieval armor is the helmet. All of the belligerent nations used helmets in the World War, and the famous "shock troops" of the German army were equipped, besides, with a visor weighing four pounds and a breastplate weighing twenty pounds. The latter extended below the hips, affording protection against wounds in the vital organs. Such equipment, however, could be worn only by soldiers of exceptional strength and endurance, and only in the shock of battle.

ARMSTRONG, Samuel Chapman (1839–1893), an American educator, the founder of Hampton Institute. He was born at Wailuku, Hawaiian Islands, the son of an American missionary and was educated at Oahu College, Honolulu, and Williams College, Massachusetts. He entered the Union army, served during the Civil War and was mustered out with the rank of brigadier-general of volunteers. On leaving the army Armstrong was associated with General O. O. Howard in the Freedmen's Bureau, and during the two years in which he was engaged in this work he matured a careful plan for educating negroes. He then enlisted the aid of the American Missionary Association and numerous friends in the North, and founded Hampton Normal and Agricultural Institute. To the establishment and work of this school he devoted the remainder of his life. See Hampton Normal and Agricultural Institute.

ARMSTRONG GUN, so-called from its inventor, a kind of cannon made of wrought-iron, principally of spirally-coiled bars, so disposed as to bring the metal into the most favorable position for the strain to which it is to be exposed. Occasionally the weapon has an inner tube or core of steel, rifled with numerous shallow grooves. The size of these guns ranges from the smallest field-piece to pieces of the largest caliber, and both breech-loading and muzzle-loading guns are made. The projectile is coated with lead, which, compressing its soft coating into the grooves, gives the bullet a swift rotary motion. More modern guns are displacing the Armstrong.

William George Armstrong (1810–1900), inventor of the gun, was an English mechanical engineer. He began the study of law, but a strong interest in scientific work led him to devote himself to that field. Among his early inventions were the hydro-electric machine and the hydraulic crane. In 1846 he founded the Elswick works for the construction of this machinery, and these works are now among the most extensive of their kind. In 1854 he invented the rifled ordnance gun which bears his name, and on presenting his patents to the British government he was knighted and appointed engineer of rifled ordnance. Cambridge and Oxford conferred honorary degrees upon him, and in 1887 he was made a peer.

ARMY, a body of men trained and organized to fight on land. The modern army represents the height of efficiency in respect to organization, a fact demonstrated in a striking degree by the history of the great World War of 1914–1919. The problem of raising armies of several million men, of feeding and clothing these men, of keeping them equipped and of training them to act uniformly is one that demands a perfectly organized system. The army of to-day is a well-oiled machine, with all the parts working in unison and the whole producing at a maximum rate.

The use of long-range, rapid-fire cannon, rifles of great power, powerful machine guns, railroads for transporting troops even up to the line of battle, and motorcycles and the telephone in place of the mounted orderly for the transmission of commands even in the face of the enemy, have made possible a much more extended battle front. In many battles of the World War troops were engaged along a line hundreds of miles in length, and what in other times would have been a series of battles, disconnected in plan and bearing little immediate relation to one another, became one tremendous engagement requiring weeks for maneuvering. Different methods of intrenching, a wise use of rough country for protection, skirmish lines of single rank and infantry mounted so that they can be moved rapidly over long distances and then dismounted for fighting, are all modern developments. Search lights, automobiles, war balloons, aeroplanes, armored motor cars (tanks), range finders and a host of other appliances have added to the complexity of army organization, while improvements in firearms and explosives have added infinitely to the possibilities of destruction.

Advance in sanitary science and improvements in the care of armies in the field, however, have lessened materially the horrors of old-time warfare. A large number of the wounded in the World War were able to take their places again on the fighting line after hospital treatment. Field hospitals with appliances for surgical treatment were established near the front, where the seriously wounded could be cared for without having to risk a long journey to the rear, and an elaborate ambulance and first-aid system was organized. See WORLD WAR.

United States Army. By the Constitution of the United States, the President is made commander in chief of the army and navy of the Union, and Congress has power to raise and support armies, to regulate them and to provide for executing the laws of the Union, suppressing insurrections and repelling invasions. The military history of the United States begins with the army of Washington, and the growth has been spasmodic. The colonies in the Revolution enrolled 300,000 men in all. In 1790 the army as fixed by act of Congress consisted of 1,216 men. In 1861, at the commencement of the Civil War, the regular force amounted to only 14,000 men. In April of that year President Lincoln called out 75,000 vol-

unteers for three months. The total number of men in the army between April, 1861, and April, 1865, amounted to 2,759,050. The Southern states during this time raised an army of about 1,100,000 men, and thus in the whole United States was raised the enormous army of nearly 4,000,000 men. The army reorganization bill passed by Congress in 1901 provided for a standing army of 58,000 men as the minimum, but the president was empowered to raise it to 100,000 if necessary.

In 1916, when disturbances along the Mexican border became acute, Congress passed a new military bill—the Chamberlain-Hay—authorizing an enlargement of the army. At that time the regular army consisted of less than 100,000 men. Some of these were assigned to coast-defense duty, and others were stationed in the overseas possessions and at various recruiting points and army posts. Not much more than 30,000 were available in case of emergency, though 127,000 men and officers of the militia could have been added in case of war. The new bill authorized an increase in the regular army to a total enlisted force of the line of 175,000, and to an approximate total of 225,000, including men, officers and staff-corps. The militia (organized state forces) was Federalized and increased to a total of 425,000.

A year later, when America entered the World War, it was at once apparent that a much greater army was needed. On May 18, about six weeks after the declaration of war, the President signed the Selective Draft Act, authorizing the creation of a great national army through conscription. This act also authorized the President to increase at once the regular army to its full strength, and to draft into the service the entire National Guard (formerly the militia of the states), which was to be increased to 625,000. The registration of men subject to the draft (those between the ages of twenty-one and thirty inclusive) took place on June 5, 1917, and the calling of men to the colors was started soon afterwards. In August, 1918, the Draft Act was amended and the President was authorized to call into service all men between the ages of eighteen and forty-five inclusive, but the speedy end of the war made unnecessary an extended application of the second draft law.

At the date of the signing of the armistice, November 11, 1918, the United States army numbered 3,665,000, of whom 1,672,000 were in the United States and its overseas possessions, and 1,993,000 were in France and England. After the armistice was signed the army was demobilized as rapidly as possible, but there was a general conviction that the military establishment of the country should be on a sounder basis than before the war. The reorganization of the army and the question of military training were therefore problems for Congress and the country to consider.

Administration and Organization. To render the allies effective military aid it was found necessary to make certain changes in the army organization. The system of administration and organization effective in 1918 may be summarized as follows:

The Secretary of War, a member of the President's Cabinet, directs the affairs of the War Department and is directly responsible to the President. Through his hands all business pertaining to the army passes. He supervises estimates for appropriations, purchases supplies, makes expenditures for maintenance and transportation of the army and for certain other civil appropriations, such as the Panama Canal, etc. He has supervision over the national defense and over the harbor waters and charge of all educational matters pertaining to the army; the direction of the expenditures for the army and for supplying it with its needs are made through the Chief of Staff and Staff Bureaus of the War Department.

The Staff Bureaus are the General Staff Corps, the Chief of Staff, the Adjutant General's Department, the Inspector General's Department, the Judge Advocate General's Department, the Quartermaster Corps, the Medical Corps, the Engineer Corps, the Ordnance Department, the Signal Corps, the Bureau of Insular Affairs, and the Militia Bureau.

The General Staff Corps is the chief advisory board to the President and the Secretary of War. It consists under the new law, of fifty-five officers detailed to it. These men study military problems, plans for defense, the utilization of the military forces and improve the efficiency of the army in general. It prepares all plans of campaign and collects all military information. Its work has been the most efficient of any work yet done for the army.

The Adjutant General's Department cares for records, orders and correspondence of the army. Orders and instructions from the War Department are issued through the Adjutant General.

The Inspector General's Department is responsible for the inspection of the upkeep of army posts, service schools, camps, hospitals,

armories, arsenals, the various depots, barracks, etc. In fact, its scope embraces every branch of military affairs. The Inspector General's Department furnishes the watch dogs for maintaining efficiency and economy. In a way, its personnel are the doctors of the military organization.

The Judge Advocate General's Department is the legal bureau of the War Department.

The Engineer Corps lays out and prepares fortifications and lines of march, does all pioneering work, bridge building, surveying, map making and the construction and repairing of all roads, bridges and fortifications. Its personnel is also in active service with the mobile army.

The Signal Corps has complete charge of the wireless, telegraph, aviation and visual signal methods. It constructs, operates and repairs all of the systems of communication. The new aviation corps now becomes one of the most important branches of the Signal Corps.

The Medical Department regulates the sanitary organization of the army and its camps. It is divided into two main subdivisions, the hospital corps and the ambulance service. With these subdivisions it cares for the sick and wounded.

The Ordnance Department provides guns, small arms, ammunition and the many articles classed as arms and munitions. It also operates the government arsenals.

The Quartermaster Corps may be called the army's storekeeper as well as the army's housekeeper. It is organized to supply the army with everything but arms and ammunition. The Quartermaster General is also the paymaster of the army.

Branches of the Service. The land forces are divided into the mobile army and the coast artillery. The mobile army is organized for offensive operations and consists of the infantry, field artillery, cavalry, engineers and signal corps troops.

The infantry forms the backbone of a country's military force and on its strength is based the strength of all other branches of the service.

The foot soldier is the most independent and complete fighting unit in the army. As long as he has strength to carry his arms, ammunition and equipment he can take himself from battlefield to battlefield, independent of aid.

Good, effective infantry, the only kind worth having, must be trained, disciplined and capably led. The infantry service is the least technical of any branch, but it requires longer and more severe training and disciplinary measures than any other branch. Team work is essential. The spirit of the team is first installed in the men on the parade ground and is developed steadily by the more technical training.

The cavalry was formerly known as the eyes and ears of the army, but the aerial branch of the service has usurped many of its prerogatives. The cavalry, however, is used extensively in reconnaissance or scouting. It also screens the main army by keeping the enemy at a distance. The cavalryman, in addition to his horse, has for arms a long-ranged rifle, an automatic pistol and a saber. Usually the cavalry's place is on the outskirts of an army, but in battle its versatility in open fighting is great and it is considered the best arm to follow up a defeated army and turn defeat into rout through the vigor of its attacks.

The field artillery is divided into horse artillery, light artillery, siege artillery and mountain artillery. The light and horse artillery are armed with the light field pieces, mounted on field carriages. The gunners either ride on the gun and ammunition carriages or are mounted on the horses. The mountain artillery is armed with light field pieces that may be carried on pack mules. The men are not mounted, while in the horse artillery, all the men are mounted. The siege artillery is armed with heavy, mobile guns which are drawn from place to place either by horses or motors. Under modern warfare conditions siege artillery is often mounted on armored railroad cars.

The coast artillery is made up of fixed or stationary guns set in batteries in fortifications at points where the landing of an enemy or naval attacks may be effectively opposed.

Units of Army Organization. The smallest unit in the army is the "squad," usually consisting of eight men, one of whom is the leader, called the "corporal."

Two, three or four squads (usually three) may be joined in the next higher unit, which is called a "platoon." The platoon, however, is not so permanent as a squad, but it is formed whenever there is need for it in drilling or on the firing line.

Next comes the "company," which is made up at full strength of 150 men; this is about eighteen squads or six platoons. However, these figures for the number of squads and of platoons in a company are never definitely fixed. A company in the field is very seldom at full strength, and it may be convenient at any time to change the number of squads and platoons.

Four companies are joined in a "battalion." The battalion is an important unit in the army organization, but it is not so clearly marked as either the company or the regiment.

The "regiment" consists of three battalions, making twelve companies. In addition, there are three special companies which do not belong to any of the battalions. These are the headquarters company, including the band and the color guard; the machine-gun company, and the supply company, responsible for the regiment's food, ammunition, and other supplies. The regiment is, of course, very seldom at full strength, but is never allowed to remain below a minimum strength of about 1,400.

The regiment is the unit that especially arouses the soldiers' pride and loyalty. The most cherished traditions of the army are made up of the splendid deeds of famous

regiments. The soldier identifies himself throughout his life by naming his regiment. His love for the army centers in his regiment. His most sacred memories cluster around the regimental battle flags.

Two regiments are joined in a "brigade." Thus the brigade is built up by assembling individual soldiers into squads; squads into platoons; platoons into companies; companies into battalions; battalions into regiments; and regiments into brigades.

Brigades may in turn be joined to form "divisions," divisions may be joined to form corps, and corps to form field armies.

Under the new plans an infantry regiment will be made up as follows:

	Officers and men.
One headquarters and headquarters company	303
Three battalions of four rifle companies each	3,078
One supply company	140
One machine-gun company	178
One medical detachment	56
	3,755

Each rifle company will have a strength of 250 men and six officers. It will be divided into a company headquarters, composed of two officers and eighteen men, and four platoons. The platoons will be made up as follows:

	Officers and men.
One headquarters	2
One section bombers and rifle grenadiers	22
Two sections riflemen, twelve each	24
One section auto riflemen, four guns	11
	59

The machine-gun company under the new organization will have six officers and 172 men. It will be composed of the headquarters, three officers and twenty-one men; three platoons, each with one officer and forty-six men, and a train, thirteen men. Its armament will consist of twelve machine-guns of heavy type and four spare guns.

The headquarters company will be the largest unit of each regiment. It will be composed of seven officers and 294 men split up as follows:

The headquarters' platoon, ninety-three officers and men; including one staff section, thirty-six officers and men; one orderlies' section, twenty-nine officers and men, and one band section, twenty-eight men; one signal platoon, seventy-seven officers and men, including one telephone section fifty-one men, one section with headquarters, ten men, and one section with three battalions, sixteen officers and men; one sappers' and bombers' platoon, forty-three officers and men, including one section of sappers for digging and special work, nine men, and one section of bombers, thirty-four officers and men; one pioneer platoon for engineer work, fifty-five officers and men; and one one-pounder cannon platoon, thirty-three officers and men.

The infantry division for service in Europe will be composed as follows:

	Officers and men.
One division headquarters	164
One machine-gun battalion	768
Two infantry brigades each composed of two infantry regiments and one machine-gun battalion of three companies	16,420
One field artillery brigade, composed of three field artillery regiments and one trench-mortar battery	5,068
One field signal battalion	262
One train headquarters and military police	337
One regiment of engineers	1,666
One ammunition train	962
One supply train	462
One engineer train	84
One sanitary train, composed of four field hospital companies and four ambulance companies	949
	27,152

Division Machine-Gun Strength. A division under the new plan will include a total of fourteen machine-gun companies. Each of the four infantry regiments will have one; each of the two brigades will have a machine-gun battalion of three companies; and the division will have a machine-gun battalion of four companies. This will give each division a mobile machine-gun strength of ten companies, which can be used as special needs require, while each regiment still will have its own machine-gun equipment in one of its component companies. And, in addition, there will be forty-eight sections of auto-riflemen, each section carrying four light machine guns, one section in each of the four platoons making up each rifle company.

Noncommissioned Officers. From the first-class privates are usually chosen the corporals. These are the squad leaders. They are appointed by the commanding officer of the regiment on the recommendation of the commanding officer of the company. In addition to the regularly appointed corporals each company may have one lance corporal. This is a temporary appointment made by the company commander for the purpose of testing the ability of some private whom he is thinking of recommending for permanent appointment. In case the lance corporal does not make a good showing, or for any other reason, he may be returned to the ranks when the commander of the company sees fit.

Next above the corporal in rank comes the sergeant. There are usually nine to eleven sergeants in a company. Unless a sergeant has some other duty assigned to him, he is normally the leader of a platoon. There are, however, many special duties constantly assigned to sergeants. The first sergeant (in army slang, the "top sergeant"), for example, keeps certain company records, forms the company in ranks, transmits orders from the company commander, and performs many other important tasks. The supply sergeant

sees to bringing up supplies of all kinds to the company. The mess sergeant looks after food. The stable sergeant is responsible for the proper care of horses and mules. The color sergeant carries the national or regimental colors. There are many other grades within the rank of sergeant which can not be described here.

Commissioned Officers. Sergeants and corporals are known as noncommissioned officers, because they are appointed by their regimental commanding officer. Officers of higher ranks are known as commissioned, since they hold their rank by virtue of a commission issued to them under authority of the President of the United States. The commissioned officer is thus on quite a different footing from the "noncom" (noncommissioned officer). He obtains his rank and authority from a higher source. He is treated with respect which is of a different character from that extended to a noncommissioned officer. This is one of the fundamental things in army organization.

Lowest in rank among the commissioned officers is the second lieutenant. Above him comes the first lieutenant and above him the captain. These are the three "company officers." The captain is ordinarily the commanding officer of a company, while the lieutenants might be described as assistant captains. In the absence or disability of the captain, however, the first lieutenant takes his place and has full command, and in the absence or disability of both the second lieutenant takes the command.

Next above the captain is the major, whose proper command is a battalion. A step higher is the lieutenant-colonel, and above him the colonel, the commanding officer of a regiment. The lieutenant-colonel ordinarily assists the colonel and in his absence takes the command. In case both the lieutenant-colonel and the colonel are disabled or absent, the senior major takes the command.

The General Officers. Above the colonel is the brigadier-general, whose proper command is a brigade. Above the brigadier-general is the major-general.

One general serves as Chief of Staff of the Army. As such he supervises all troops and departments of the military service. He in turn reports to the Secretary of War. The Secretary of War in his turn acts under the general direction of the President of the United States, who is the Commander in Chief.

Canada. Previous to the outbreak of the World War the Canadian military forces consisted of a permanent militia which in March, 1914, numbered 3,000 officers, noncommissioned officers and men, and of an active militia numbering 5,615 officers and 68,991 noncommissioned officers and men. All military forces are under the jurisdiction of the Department of Militia and Defense. In times of emergency Canadians have not hesitated to show their loyalty to the British Empire, and the outbreak of the World War was the signal for a magnificent response. Troops were at once recruited, equipped, trained and sent abroad for overseas service, and successive contingents followed the first body. Up to January, 1918, when conscription was introduced, Canada enrolled over 400,000 volunteers. See CANADA, subhead *Canada in the World War*.

Great Britain. One of the provisions of the Bill of Rights of 1689 that Englishmen cherish very highly is that one which makes it illegal for the king to maintain an army in time of peace without the consent of parliament. Englishmen have never taken kindly to the idea of conscription or universal military service, and until the World War the army of Great Britain was purely a volunteer one. The army in peace times is divided into two parts, one for home defense and one for colonial or foreign service. At the outbreak of the World War the military forces consisted of a regular army of 156,110; reserves, 209,914; territorials and militia, 258,437; colonial forces, 87,114; total, 711,575. Only the regular army and the reserves were directly available for foreign service when the war broke out, but before conscription went into effect, in May, 1916, there were 5,041,000 voluntary enlistments in Great Britain.

France. A law passed in 1872 enacted that every Frenchman, with a few exceptions, unless serving in the navy, was liable to personal service in the army, and forbade substitution. The period of liability extended to twenty years, of which five were spent in the active army, four in the reserve of the active army, five in the territorial army, and six in the reserve of the territorial army. The expense of keeping up such an establishment in peace, however, led to the division of the recruits by ballot into two classes, one of which served the full five years in the active army, while the other was sent home after six months' or a year's training. One-year volunteers were also accepted; but so many men joined in that capacity, that in 1887 a bill was brought before the French legislature abolishing the privilege.

In 1913 an Army Reorganization Bill was passed, proposing a large addition to the establishment. The period of service with the colors, which had been two years since 1905, was increased to three years. The ob-

ject of the changes was to add materially to the number of efficients. Eleven years had to be spent in the reserve, seven in the territorial army and seven more in the territorial reserve. At the outbreak of the World War France had a total force of about 703,000 in arms, and nearly 5,000,000 trained men of military age. It is supposed that considerably more than this number were called to the colors during the war. French troops, though they are rather small in stature, are capable of great activity and endurance, and are noted for the impetuosity of their attack as well as for the heroism of their resistance.

Italy. Universal liability to military service prevails in Italy, which maintains a permanent army of 400,000 in time of peace. In order to strengthen the sentiment of national unity each regiment receives recruits from all over the country, instead of from a particular section, and every four years the troops change stations. Italy's war strength is over 3,000,000 men.

Russia. At the outbreak of the World War Russia maintained the largest standing army in the world, consisting of about 1,300,000 men in arms and a reserve force of perhaps 6,000,000. The country could draw on, it was believed, 10,000,000 men. After the revolution of 1917 disintegration began, and when peace was made with Germany, in 1918, the old army was demobilized. The leaders of the Bolsheviki, however, maintained an army for the defense of the revolution, and by 1919 it was said to number 600,000 men.

Germany. Compulsory military service prevailed throughout the empire after the constitution of 1871 went into effect, and in the intervening time Germany created a military machine unmatched in history. The total strength of the army in peace times was 770,000, but Germany always had at command a great body of trained fighters, numbering nearly 8,000,000. Each male had to serve two or three years in the standing army, and the rest of a period of seven years in the reserves. At the end of this period he was drafted into the *landwehr*. When he was thirty-nine he entered the *landstrum*, where he stayed until he was forty-five. This body was made up of those who could be called upon in case of an emergency, and it included both the graduates of the *landwehr* and the younger men who for any reason had been excused from military service. Actual training ordinarily began at twenty, but if deemed necessary lads of seventeen could be called into service. After the signing of the armistice the allies insisted on Germany's keeping under arms only enough men to preserve order. The military establishment of the republic of Germany was to be determined later.

Other Nations. Most of the other nations of Europe, many of the South American republics and Japan follow the system of compulsory military service, and Japan has one of the most efficient armies in the world. A force of 1,000,000 trained fighters could be mobilized on short notice, and if necessary the nation could raise an army of over 3,000,000. The Japanese army system follows more or less closely the German plan of organization.

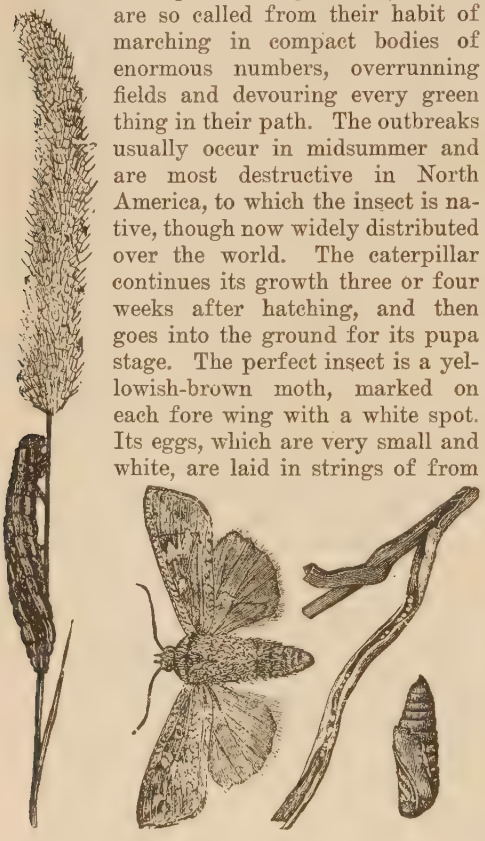
Disarmament. The delegates to the Peace Conference which met in Paris early in 1919 began the consideration of a plan whereby national armaments might be greatly reduced. There was a widespread feeling that the maintenance of huge standing armies is not only an intolerable burden on the people, but a menace to the peace of the world. The total abolition of conscription was freely discussed as a near possibility.

Related Articles. Consult the following titles for additional information:

Adjutant
Aid-de-camp
Ammunition
Amnesty
Armistice
Arms and Armor
Arsenal
Battalion
Battering Ram
Battery
Bayonet
Bersaglieri
Blockade
Blunderbuss
Bomb
Bombardment
Boomerang
Bow
Brevet
Brigade
Bugle
Bullet
Cannon
Cartridge
Catapult
Cavalry
Colonel
Conscription
Contraband of War
Cordite
Corporal
Countersign
Court-martial
Ensign
Explosives
Flag
Flying Machine
Fortification
Gendarmes
Greek Fire
Grenade
Guncotton
Gunpowder
Helmet
Hostage
Hotchkiss Gun
Howitzer
Infantry
Iron Cross
Lance
League of Nations
Lieutenant
Lieutenant General
Liquid Fire
Machine Gun
Major
Major General
Marshal
Military Academy United States
Militia
National Guard
Neutrality
Parole
Phalanx
Prisoners of War
Rank
Rebellion
Regiment
Revolver
Rifle
Rough Riders
Sergeant
Shell
Shield
Shot
Shotgun
Shrapnel

Siege
Signal Corps
Signaling
Slings
Smokeless Powder
Squadron
Staff
Sword
Tactics
Tank, Armored
Tomahawk
Torpedo
Uhlans
Uniform
Victoria Cross
Volunteers
War
Zouaves

ARMY WORM, a striped caterpillar about an inch and a quarter long. Army worms are so called from their habit of marching in compact bodies of enormous numbers, overrunning fields and devouring every green thing in their path. The outbreaks usually occur in midsummer and are most destructive in North America, to which the insect is native, though now widely distributed over the world. The caterpillar continues its growth three or four weeks after hatching, and then goes into the ground for its pupa stage. The perfect insect is a yellowish-brown moth, marked on each fore wing with a white spot. Its eggs, which are very small and white, are laid in strings of from two to twenty, beneath the sheaths of grass stems, where they hatch in eight or ten days.



ARMY WORM
Worm, pupa, moth and eggs.

AR'NICA, a genus of plants, consisting of about twelve species, one of which is found in Central Europe and in the Western states of the Union. It has a perennial root, a stem about two feet high, bearing on the summit heads of a dark golden yellow. In every part of the plant there is an acrid resin and a volatile oil, and in the flowers an acrid bitter principle called *arnicin*. The root contains also a considerable quantity of tannin. A tincture of arnica is employed as an external application to wounds and bruises, as it drives away the blood that collects around the injury.

AR'NOLD, BENEDICT (1741–1801), an American general who both served and betrayed his country. He was born in Norwich, Conn., and received a common school education. At the outbreak of the Revolution he entered the army, and after the Battle of Lexington he was sent to lead an expedition for the capture of Crown Point and Ticonderoga. On his way thither he met Ethan Allen with a company of soldiers intended for the same purpose. Allen took the lead and captured Ticonderoga, and four days later Arnold captured Saint John's. In the autumn of the same year Washington dispatched Arnold with one thousand men to assist in capturing Quebec, and after his juncture with General Montgomery a combined attack was made. The American army was defeated, Montgomery was killed, and Arnold's leg was fractured. Congress promoted him to the rank of brigadier-general for his bravery in this campaign. In 1776 he fought a naval battle on Lake Champlain, during which he ran his own vessel ashore, burnt her, and with his other ships retreated to Ticonderoga.

ARNICA PLANT

In 1777 Congress appointed five major-generals for the army, all of whom were Arnold's juniors. He was stung by this injustice, and Washington wrote to assure him that he would endeavor to remedy "the error," but when his claims were presented Congress voted him thanks, but did not promote him. In the same year Washington urged Congress to send Arnold north to head off General Burgoyne. Arnold consented to serve, and he fulfilled his part in the

campaign faithfully. He joined General Schuyler and led an expedition to relieve Fort Stanwix, which was besieged by a force of British and Indians, and he then returned to the main army and took part in the first Battle of Bemis Heights (see SARATOGA, BATTLES OF). Soon afterward Congress sent him a commission as major-general, in recognition of valued service.

In 1778 Arnold was appointed to the command of Philadelphia. He became involved in quarrels with the authorities of Pennsylvania and was tried by court-martial, but was acquitted of intentional wrong-doing, though in some respects his conduct was declared improper. The sentence was that he should receive a reprimand from the commander in chief. Washington discharged this duty with considerable reluctance, and assured Arnold of his continued esteem and of the high estimate he placed on his services.

Arnold's first wife had died, and he married Miss Margaret Shippen, a daughter of Chief Justice Shippen of Pennsylvania. Through this marriage he was brought into connection with several Tory families, and a correspondence was opened with Sir Henry Clinton. In 1780 he was given the command at West Point, and he began at once to plan to surrender it to Clinton. His treachery became manifest through the capture of Major André, and Arnold escaped to New York City. He was compensated with a British brigadier-general's commission and a sum of money, but he was despised and shunned even by the British, and died in obscurity.

ARNOLD, EDWIN, Sir (1832–1904), a British poet, scholar and journalist, best remembered for his *Light of Asia,* a poem presenting the life and teaching of Gautama, the founder of Buddhism. In 1861 he joined the editorial staff of the *Daily Telegraph,* with which he was connected for many years. He was the author of poems, narrative and lyrical; of numerous translations from the Greek and Sanskrit; of *Pearls of the Faith, The Voyage of Ithobal, East and West,* and various other works.

ARNOLD, MATTHEW (1822–1888), an English critic, essayist and poet, a son of Dr. Thomas Arnold of Rugby. He was for many years a British school inspector and was for a time professor of poetry at Oxford. As both poet and critic, Arnold was highly esteemed in his own day, and his reputation has grown steadily, so that while he does not appeal especially to the popular taste, he ranks as one of the very foremost of English critics, and as one of the great poets of the Victorian Age. Besides *Sohrab and Rustum,* his most popular poem, *Balder Dead* and *Tristram and Iseult,* he wrote many beautiful shorter poems, among which are *The Forsaken Merman, Dover Beach, Faded Leaves, A Summer Night* and *The Youth of Man.* His *Thyrsis* stands with *Lycidas* and *Adonais* as one of the finest elegies in English. The bulk of his poetry is relatively small. His best-known critical essays are contained in the two series of *Essays in Criticism.* Among his other prose writings are *Culture and Anarchy, On Translating Homer* and *Literature and Dogma.*

ARNOLD, THOMAS (1795–1842), an English scholar, clergyman and teacher, whose work as headmaster of Rugby gave him a permanent place in the list of great educators. He was born at Cowes, Isle of Wight. While a student at Oxford, he became known for the boldness and independence of his views and his excellent scholarship. Arnold's life work began when he was elected headmaster of Rugby School. During his administration he completely revolutionized the methods of instruction and discipline and wielded such an influence in England that many of his contemporaries adopted his plan, and he is considered to have been the means of completely changing the system of education in the English public schools. Arnold accomplished his work not so much by his direct methods of teaching as through his influence upon the pupils and the ideals which he set before them. His main purpose was the development of character, and this he secured through his strong personality, thorough trust in his pupils and the blameless life which he led. Consult Fitch's *Thomas and Matthew Arnold, and Their Influence on English Education;* also *Tom Brown's School Days.*

AROMATIC, *ar o mat'ik,* **PLANTS,** a class of plants having a characteristic spicy odor, and possessing qualities that make them of value as flavoring. They are utilized to improve the taste of foods, in the preparation of perfumes, and to neutralize the disagreeable taste of certain drugs. Well-known aromatic plants include cinnamon, thyme, lavender, anise, ginger, sandalwood

and sage. For description, see articles in these volumes under the above headings.

ARRAS, *ahr'ras,* FRANCE, capital of the department of Pas-de-Calais, was laid in ruins by bombardment during the World War. Arras was situated thirty miles northeast of Amiens, and from the first invasion of France it remained a part of the war zone. In the spring of 1917 the allies began an offensive movement in the vicinity of Arras, which resulted in a deadlock. A year later, when the supreme German offensive began, the ruined town was one of the chief objectives between Armentieres and Amiens. At the outbreak of the war it had a population of about 25,000, and was a flourishing grain center.

ARREST', a term in law signifying the process whereby a person charged with crime is taken into custody. Arrests may be made by a justice of the peace, a constable, a deputy or a policeman. The person arrested may be released if bail is furnished (see BAIL), except in case of wilful murder and treason, and may remain at liberty, though within the jurisdiction of the court, until his trial is called. See HABEAS CORPUS.

ARROWROCK DAM. See IRRIGATION, subhead.

AR'ROWROOT, an edible starch obtained from the rootstocks of several different species of plants. It is not known exactly how the name originated, but it may be due

ARROWROOT

to the fact that the scales on the roots of some plants are shaped liked an arrowhead. Large quantities of arrowroot are imported every year into the United States and Europe. It is a delicate starch and is used as a food, especially for invalids and infants. The arrowroot of the stores is very apt to have been adulterated with rice starch or even the starch of common white flour.

AR'SENAL, an establishment where guns, arms or other munitions of war are repaired and stored. Those which deal with the ships and their armament are called *naval arsenals,* or, in the United States and England, *navy yards.* Explosives are usually manufactured at places removed from the general arsenals and out of the way of the public. In 1777 at Springfield, Mass., was established the first American arsenal, and since 1787 the manufacture of small arms has been continued at this place. Harper's Ferry arsenal was built in 1795.

At present the largest of the United States arsenals are located at Rock Island, Ill., and Springfield, Mass. Others are at Pittsburgh, Pa.; Augusta, Ga.; Benicia, Cal.; Columbia, Tenn.; Fort Monroe, Va.; Philadelphia, Pa.; Indianapolis, Ind.; Governor's Island, N. Y.; Jefferson Barracks, Mo.; Sandy Hook, N. Y.; San Antonio, Tex.; Dover, N. J.; Watertown, Mass., and Watervliet, N. Y. Some of the above are merely powder depots, the principal manufacturing plants being at Rock Island, Springfield and Watervliet.

AR'SENIC, a metallic element of very common occurrence, found in combination with many of the metals in a variety of minerals. It is of a dark-gray color and readily tarnishes on exposure to the air, changing first to yellow and finally to black. In hardness arsenic equals copper; it is extremely brittle and evaporates quickly, beginning to waste away before it melts. It burns with a blue flame, and emits a smell of garlic. It forms alloys with most of the metals. Combined with oxygen, arsenic forms two compounds, the more important of which is the *white arsenic,* or simply *arsenic* of the shops. It is usually seen in white, glassy, translucent masses, and is obtained by sublimation from several ores containing arsenic in combination with metals, particularly from arsenical pyrites.

Of all substances arsenic is that which has most frequently occasioned death by poisoning, both by accident and design (see ANTIDOTE). Like many other virulent poisons, it is a safe and useful medicine, especially in skin diseases, when judiciously

employed. It is used as a flux for glass, and also for forming pigments. The arsenite of copper and a double arsenite and acetate of copper (emerald green) are largely used by painters; they are also used to color paper-hangings for rooms, a practice not unaccompanied with considerable danger, especially if flock-papers are used or if the room is not well ventilated. Arsenic has been too frequently used to give the bright green often seen in colored confectionery, and to produce a green dye for articles of dress and artificial flowers.

AR'SON, in common law, the malicious burning of a dwelling-house or outhouse of another man; also, the wilful setting fire to any church, warehouse, mill, barn, agricultural produce, ship, coal-mine and the like. By the common law it is a crime, and if homicide result, it is murder. In the United States and Great Britain the punishment is increased if the burning is to defraud insurers. See CRIME.

ART AND THE ARTS. In a broad sense the term *art* refers to anything which is not an immediate product of nature, but is artificial and done by the aid of human skill. It is also used to designate skill in performing some special kind of work, either mental or physical. By *arts* we mean those phases of human activity which result from the application of skill or genius. The arts may be classified into *useful* or *mechanical* arts, and *fine* arts. The latter embrace painting, sculpture, architecture and music, and some would include in this list, poetry. Basket weaving, pottery making, embroidering, etc., are classed as useful or mechanical arts. The mechanical arts may be practiced by any one who has acquired skill, but the fine arts may be successfully practiced only by those who have real genius or talent, as well as skill. Such studies as philosophy, science and history are called liberal arts.

Related Articles. Consult the following titles for additional information:

Architecture	Painting
Fine Arts	Poetry
Music	Sculpture

ARTAXERXES, *ahr'taks urks'eez,* the name of several Persian kings, most important of whom was Artaxerxes, surnamed *Mnemon,* who succeeded his father, Darius II, in 404 B. C. After having vanquished his brother Cyrus in the Battle of Cunaxa, he made war on the Spartans, who had assisted Cyrus, and forced them to abandon the Greek cities and islands of Asia to the Persians.

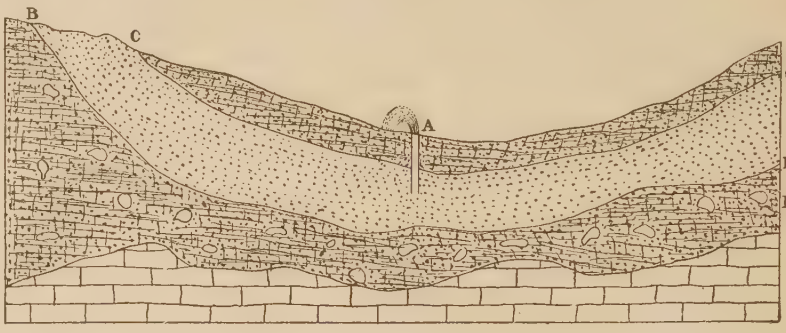
AR'TEMIS. See DIANA.

AR'TERIES, the system of vessels or tubes which convey the blood from the heart to all parts of the body. As they proceed from the heart, they divide and subdivide, diminishing in size, and finally terminating in minute capillaries that unite the ends of the arteries with the beginnings of the veins. The arteries are made up of three coats: an outer elastic one which is readily distended; a middle or muscular one which by its contraction helps to force the blood onward; an inner one, smooth, in order that the blood may move easily. The coats gradually disappear as the arteries decrease in size; when the muscular coat has gone, the artery has become a capillary with but one thin coat. The life of any part of the body being dependent on the supply of arterial blood, the tiny arteries anastomose, or join with one another in the form of a network, so that if the supply is cut off from one it may go through another. The blood flowing from a wounded artery is bright red in color and comes out in spurts in an uneven stream. To check the flow, press on the artery between the wound and the heart. Cording the limb is effective. See CIRCULATION; VEINS; WOUNDS.

ARTESIAN, *ahr te'zhan,* WELL, a well formed by boring or drilling to a considerable depth. These wells were named from the province of Artois in France, where they appear to have been first used on an extensive scale. At first the name was restricted to flowing wells, but now it is applied to all wells formed by boring. In the cut, *B* represents a layer of porous sand and gravel between two impervious layers, *C* and *D*. If a well is sunk through *C,* the water will rise in it and flow at *A,* because the highest point of *B* is above the level of *C* at the point where the well is bored. When the land is nearly level the well will not flow and pumping must be restored to. The layer *B* is supplied with water from rain which falls upon it where it appears at the surface. This percolates down through the sand and gravel until the entire layer is saturated. If the area covered by this layer is large, the volume of water thus stored is very great, and many wells may be bored in the region which it underlies.

The water in most artesian wells is pure and suitable for domestic purposes and for

stock, though it occasionally contains minerals. Artesian wells are very common in all regions where surface water of good quality is not easily obtained. In the semi-arid districts of the United States, as well as in some other parts of the world, they are also used for obtaining water for irrigation. In South Dakota there are numerous artesian wells for irrigating, having a flow of from 2,000 to 4,350 gallons per minute. For the method of sinking artesian wells, see WELL BORING.



ARTHROP'ODA, or **ARTICULATA**, the sixth family of the animal kingdom, so named because the bodies of its members are in joints or segments. Each segment, in typical form, carries two appendages which are jointed and which perform special functions. Some are suckers; some are used in swimming, and others are jaws, organs of sense or savage, defensive weapons. There is an organ which resembles a heart, but the blood returns to it through the tissues of the body and not through the veins. The Arthropoda possess a well-organized nervous system, and usually have either simple or compound eyes. Many species of Arthropoda are parasitic in their life, and in this case they lose the use of many of their organs, some of which disappear entirely. The Arthropoda compose a large and important branch, chief among them the insects, the spiders and the crustaceans. The reader should consult the articles CRUSTACEA, ARACHNIDA, MYRIAPODA; INSECTS, and the numerous articles therein referred to.

ARTHUR, CHESTER ALAN (1830–1886), twenty-first President of the United States, one of the five Presidents who have attained the nation's highest office by succession from the Vice-Presidency. Arthur succeeded to the Presidency in 1881, on the death of Garfield. He was born at Fairfield, Vt., of Scotch-Irish parentage, his father being pastor of Baptist churches in Vermont and New York. He was graduated from Union College, Schenectady, N. Y., in 1848, studied law and practiced successfully in New York, becoming conspicuous as counsel in the famous Lennon case, which resulted in giving negroes equal rights with whites in New York City street cars. During the Civil War he was commendably energetic, as quartermaster-general of New York, in the raising and equipping of troops.

For his activity in Republican politics, Arthur was afterward made collector of customs for the port of New York, and was reappointed in 1875. He thereafter identified himself with the Conkling or "Stalwart" faction in the state of New York, and with the Conkling-Grant wing of the party in their 1880 campaign (see CONKLING, ROSCOE). In that year, as a concession to this faction, which was defeated, he was nominated for Vice-President, and upon the death of President Garfield in 1881 became President.

CHESTER A. ARTHUR

Arthur's somewhat questionable activity in partisan politics, which had continued during his term as Vice-President, suddenly ceased, and his administration was a creditable record of honesty and fearlessness. The chief events of his term of office were the appointment and report of a tariff commission, action against polygamy and Chinese immigration, agitation in favor of an increased navy, and the passage of the Pendleton Civil Service Act. Other events of importance were the holding of the Atlanta Cotton Exposition, the com-

ADMINISTRATIONS OF GARFIELD AND ARTHUR 1881 1885

YOUNG GARFIELD ON THE TOW-PATH.

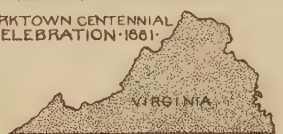
$364,000 AND PRESIDENT'S SALARY DONATED TO GARFIELD'S WIDOW.

BROOKLYN BRIDGE COMPLETED · 1883 ·

EVENTS OF THE BRIEF ADMINISTRATION OF GARFIELD

The Teacher President.
DIVISION OF REPUBLICAN PARTY OVER "DISPOSITION OF SPOILS."
PLATT AND CONKLING RESIGN FROM THE SENATE.
ASSASSINATION OF THE PRESIDENT, JULY 2, 1881.
STAR ROUTE INVESTIGATION.

OVERFLOW OF MISSISSIPPI · 1862 ·
NEW ORLEANS COTTON CENTENNIAL EXHIBITION · 1884 ·



YORKTOWN CENTENNIAL CELEBRATION · 1881 ·

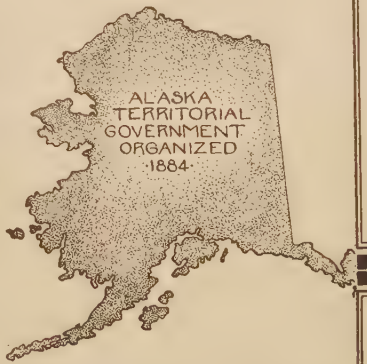
· 1885 · DEDICATION OF WASHINGTON MONUMENT.

LAWS.

Anti-Polygamy.
Anti-Chinese.
Civil Service.

DEATHS.

Emerson.
Longfellow.



OTHER EVENTS

NORTHERN PACIFIC COMPLETED.
POSTAL NOTES INTRODUCED.
STANDARD TIME INTRODUCED.
RED CROSS SOCIETY ORGANIZED.
POLITICAL PARTIES:
ANTI-MONOPOLY AND LABOR.
LETTER POSTAGE REDUCED TO TWO CENTS.
WASHINGTON'S STATUE UNVEILED, NEW YORK.

H. M. HAINES.

Outline on Chester A. Arthur

I. Chester Alan Arthur
- (1) Birth
- (2) Ancestry
- (3) Education
- (4) Activity in public life
- (5) Character
- (6) Death

II. Governmental Affairs
- (1) Important laws
  - (a) Chinese Exclusion Act
  - (b) Anti-polygamy Act
  - (c) Tariff Act of 1883
    - (1) To reduce surplus of the treasury
    - (2) Reductions in import duties
    - (3) Extensive cuts in internal revenue taxes
  - (d) Pendleton Civil Service Act
- (2) Other important events
  - (a) Tariff commission
  - (b) Alaska organized
  - (c) Organization of the Bureau of Labor
  - (d) Two-cent rate of postage
  - (e) Standard time adopted

III. Local and Internal Affairs
- (1) Northern Pacific Railway opened
- (2) Red Cross Society formed
- (3) Brooklyn Bridge finished
- (4) Deaths of Emerson and Longfellow
- (5) Dedication of the Washington Monument
- (6) Expositions
  - (a) Atlanta
  - (b) New Orleans

Questions

Give a brief account of Arthur's early life.

What was the purpose of the Anti-polygamy Act?

What territory was organized in 1884?

When was the system of standard time adopted?

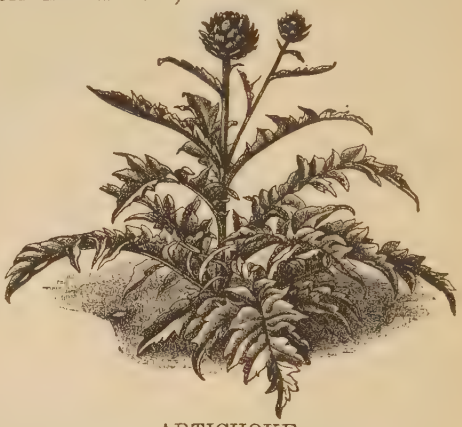
Who was Clara Barton?

What great monument was formally dedicated in 1885?

pletion of three transcontinental railroads and of the Brooklyn Bridge, the reduction of letter postage to two cents, the organization of the American Red Cross Society, and the organization of a territorial government for Alaska.

Arthur was a candidate for the Republican nomination in 1884, but was defeated in the convention by James G. Blaine. Two years later he died, and was buried at Albany, N. Y.

ARTHUR, Julia (1869–), an actress, born in Hamilton, Ontario. Her real name



ARTICHOKE

is Ida Lewis. She began amateur dramatic work when only eleven years old, and three years later made her professional debut as the Prince of Wales in Daniel E. Bandmann's presentation of *Richard III.* She developed unusual powers and later became one of Sir Henry Irving's company, playing with him and Miss Ellen Terry in various Shakespearean rôles.

ARTHUR, King, a hero said to have reigned as king of the Britons in the sixth century. He married Guinevere, and established the famous Round Table at his court at Caerleon-on-Usk. On all sides the invaders of his country were defeated, the land was reduced to order and his knights rode abroad redressing wrongs. Despite his example and precepts, some of his knights remained evil and treacherous, and while he was absent on an expedition to Rome, Modred, his nephew, stirred up a rebellion. In his contest with the rebellious knights on his return, Arthur was mortally wounded. He was carried away to the island of Avalon to be healed, and for a long time the Britons in the generations which followed him be-

lieved that he would return and reëstablish his righteous rule. This story of Arthur is supposed to have some foundation in fact. It has been used as a basis for many poems, notably Tennyson's *Idylls of the King.*

AR'TICHOKE, a well-known plant somewhat resembling the thistle, with large, divided, prickly leaves. The erect flower-stem terminates in a large, round head of numerous oval, spiny scales, which surround the flowers. The fleshy bases of the scales, with the large receptacle, are the parts that are eaten. The Jerusalem artichoke is a species of sunflower, whose roots are used like potatoes. (Illustration, page 236.)

ARTICLE, in grammar, a name given to two words used as limiting adjectives. They are the definite article, *the,* and the indefinite article, *a* or *an.* See ADJECTIVE.

ARTICLES, THE THIRTY-NINE, of the Church of England, a statement of the particular points of doctrine, thirty-nine in number, maintained by the English Church. They were first promulgated by a convocation held in London in 1562–1563 and were confirmed by royal authority. The original articles, forty-two in number, were drawn up by a commission of eight bishops, eight divines, eight civilians and eight lawyers appointed in 1551, Ridley, Cranmer and Coverdale being among the number, and were issued in the reign of Edward VI. Queen Mary would not acknowledge them, but, under Elizabeth, Archbishop Parker revised them, reducing them to thirty-nine. They were ratified anew in 1604 and 1628. They are a formula, not a creed, of the Church. By the Clerical Subscription Act of 1866, the clergy do not have to subscribe to these articles, but declare an assent to them and the Prayer Book. Since 1871 members of Oxford and Cambridge Universities have not been obliged to sign them. This formula is now accepted by the Episcopalian churches of Scotland, Ireland and America.

ARTICLES OF CONFEDERATION. See CONFEDERATION, ARTICLES OF.

ARTICULA'TION, in anatomy, the process whereby the bones are joined together. A good example of articulation is the union of the two bones which form the shoulder joint. (For detailed description, see the article JOINTS.)

Articulation is also used to signify the distinct utterance of sounds in speech.

ARTIFICIAL, *ahr ti fish'al,* **LIMBS.** Accident and disease have always resulted in loss of limbs, and rude substitutes for them were early designed. But it was not until the nineteenth century that substitutes were made so successfully as partially to conceal the wearer's loss. At the outbreak of the World War the United States had progressed farther than any other nation in the science of making artificial parts of the body, but the serious character of the fighting in that struggle caused the art to develop rapidly in Europe. Arms, legs, noses, eyes and ears are now made with marvelous skill, and the wearers are able to perform almost all kinds of work; in addition, they may engage in many sports.

How Made. Limbs are made principally of the fine, close-grained wood of the English weeping willow, though aluminum is now used to a considerable extent because of its lightness and strength. If the limb is to be made of wood, the piece is first turned in the lathe to the general shape of a leg or arm and then hollowed out until the shell is from one-fourth to five-eighths of an inch thick. It is then whittled down to the general shape required, when the proper angles and depression in the top of the inside portion are cut so that it will exactly fit the stump for which it is intended. Upon the accuracy of this fit depends the comfort which the wearer will enjoy. The foot is whittled out entirely by hand, and is fastened to the leg by means of a hinge; the more expensive pieces have another hinge fitted up for the toes. When the amputation is above the knee, another hinge is prepared for the knee-joint, so that the leg will swing readily in walking. After the wooden pieces have been completed and polished, a fine piece of rawhide is shrunk over them and fastened by means of glue. As the skin dries it shrinks and adds much strength, but does not increase the weight materially. The bottom of the foot is made of soft rubber, for the purpose of giving a natural spring in walking. Limbs are attached usually by means of leather bands which may be laced tight, or are held up by straps running over the shoulders like suspenders. Arms are often so fitted that the hand may be unscrewed, and a knife or fork or hair brush, made especially for the purpose, put in its place. Deformed feet are often pieced out with blocks of wood whittled to the proper shape.

In making artificial eyes, the first step is to blow a bulb from molten glass; then one side is broken out, the edges of the remaining shell are blunted, and the shell itself is worked into the proper size and shape, which have been determined previously by measurement. By very delicate and skilful handling, pieces of colored glass are worked in by heat until a perfect imitation of the person's remaining eye is secured. The coloring of the iris is the most difficult step in the process. Ears and noses are usually made of papier-maché.

ARTIL'LERY, a military term employed with two meanings. It relates to the guns which are so large they cannot be carried by soldiers and are therefore transported on wheels or on great trucks, and also to that branch of the service whose members are in charge of their operation.

The guns that are included in the artillery are known as mortars, howitzers, and the common form of long guns collectively called cannon. The latter term to the civilian covers all classes of large guns. The particular kind of gun that is of most value in battle is the comparatively light, quick-firing variety which can be drawn quickly from place to place by four or six horses. It fires a shell with a diameter of from three to six inches, and is light enough to accompany an army corps. The opposite of this gun is the great monster on a massive carriage of steel, so heavy that it can be moved only on specially-constructed railroad cars. Frequently such a gun is placed in firing position on the ground on a bed of concrete, in which case its removal requires several days.

So-called *light artillery* is easily concealed in screened positions—in forests or, in their absence, by a covering of tree branches and the like, to deceive the enemy. Often these guns are painted in the colors of their surroundings; this means of deception is called *camouflage.*

The gun for which was claimed the greatest destructiveness in the World War is the French "75". It can be drawn by two horses, and requires but few men in its actual operation. It fires a shell 2.9 inches in diameter, weighing from twelve to fifteen pounds, has a range of three to four miles, and can be fired with great rapidity. British and American guns of similar caliber are nearly as effective. The Germans and Austrians in the World War relied largely upon such guns, but they placed even more reliance upon great weapons which they placed from five to ten miles back of the front battle lines and from those safer positions hurled shells of ten to sixteen inches in diameter upon the foe. When the range was correct, these weapons were wonderfully effective.

The greatest guns ever made were of German invention. The details of their construction were not known until 1919 to Germany's enemies, but from their firing range some facts were deduced during the war. The existence of such guns was disclosed in March, 1918, when from a distance of seventy-six miles they sent shells into Paris. These weapons were between ninety and 100 feet in length, and their projectiles weighed about a ton. The shell in its journey towards its far-distant objective soared fifteen miles above the earth, and made the distance in three minutes. The longest-range gun previous to the development of the monster just described was also of German origin, with a range of about twenty-two miles—sufficient to shell Dover, England, from the cliffs of Calais, France, had the German armies reached the latter city in their great effort of 1918.

There were rumors of guns being perfected in the armories of France and England which would have a range of 100 miles, but this was doubted, for the value of such instruments of war is more psychological than real.

In 1914, when the United States perfected cannon for the protection of New York harbor and for the defenses of the Panama Canal it was believed these weapons were the most powerful in the world. But the World War, coming in the same year, brought inventive genius to the front, and such guns were speedily outclassed for land use. However, for coast defense they have a range greater than any naval gun in use to the year 1919. These guns are forty-nine feet long, weigh 130 tons, fire a shell five and one-half feet long weighing 2,400 pounds, and have an effective range of twenty-one miles. Several of these guns were mounted on cars and taken to the battle front and spread terror in the ranks of the enemy in the vicinity of Metz.

For aircraft the favorite weapon is the machine gun, although light 2-inch rapid-firers were used in the late months of the World War.

Related Articles. The various kinds of heavy guns are described in these volumes under the titles:

Cannon	Machine Gun
Howitzer	Mortar

ARTS AND CRAFTS, a phrase which includes the art of design and handicraft—all those arts which go to "the making of the house beautiful." The phrase is now generally applied to the artistic revival in handicrafts which began about 1875. Especially in England, the growth of the factory system, with its specialized functions for each workman, seemed to have destroyed all artistic impulses or feelings among workmen. As early as the forties and fifties public interest in wood-carving, metal work, spinning and weaving, pottery and other arts was steadily growing, but it was not until 1888 that the Arts and Crafts movement was recognized as a distinct break with the past. To rescue public taste from the cheap imitations of foreign models, to encourage sound workmanship, and to raise the handicrafts to their rightful position as arts, these were the aims of the leaders. The success of the movement was due chiefly to the artistic and practical skill of William Morris. Emphasis on the personality of the workman, regard for the material and purpose of an object as controlling factors in determining artistic expression, and a certain simplicity of design and reserve in the use of ornament are characteristic of this school. Among noted American leaders of the movement was Elbert Hubbard, founder of the Roycrofters.

A'RUM, a genus of plants more commonly known as calla, closely related to the Jack-in-the-pulpit and the skunk cabbage. The flowers are small and inconspicuous, being closely massed in a short spike, or spadix, enclosed and over-hung by a vari-colored leaf, or spathe. Many varieties are cultivated in hothouses on account of the beauty of their spathes. The stems and leaves contain a bitter juice, and the bulbs from which the plants spring have a starch which may be used for food. See CALLA; JACK-IN-THE-PULPIT.

ARYAN, *ahr'yan,* the name given to a branch of the human family, living originally, it is believed, in the steppes of Southern Russia. As they came to be the ruling race of India, of Persia and finally of Europe, all modern European languages have developed from the Aryan. The tendency now is to restrict the use of the term Aryan to that branch of the human race whose ancient language was Sanskrit, and to use the name Indo-European or Indo-Germanic in the wider sense.

ASAFET'IDA, a vile-smelling gum, the dried sap of a large Asiatic plant of the parsnip family. It is used in medicine to prevent spasms and to calm hysteria and other nervous attacks. Notwithstanding its very disagreeable odor, it is used as a seasoning in the East. Some superstitious people wear it in bags about the neck to prevent disease, but the custom prevails only among the ignorant.

ASBES'TOS, an incombustible mineral, a fibrous variety of several members of the hornblende family, composed of separable fibers, with a silky luster. The fibers are sometimes delicate, flexible and elastic; at other times they are stiff and brittle. Asbestos anciently was wrought into a soft, flexible cloth, which was used as a shroud for dead bodies. Some varieties are compact and take a fine polish; others are loose, like flax or silky wool. *Mountain-wood* is a variety presenting an irregular, filamentous structure, like wood. *Rock-cork, mountain-leather, fossil-paper* and *fossil-flax* are other varieties. Asbestos has been known for ages, but its geological history and formation are still matters of conjecture. Its attributes, too, have been known; but until modern times, very little practical use was ever made of the substance.

The uses of asbestos are many and varied. Ground fine and combined with colors and oils in a certain manner it makes a paint. Roofs are made by treating strong canvas with a combination of asbestos and felt, and backing it with manila paper. This substance is extensively used for factories, railroad shops, bridges and other places where there is danger of fire. Steam-pipes are covered with asbestos, and asbestos cement is used for hot-blast pipes and fire-heated surfaces. It is used for locomotive pistons, valve-stems and oil pumps. It is made into ropes and mill-boards, and in some states theaters are required to use an asbestos drop curtain to protect the audience in case of fire in the scenery. Iron and glass workers use mittens knit from asbestos yarn. Asbestos soldering blocks are used by goldsmiths. Asbestos, in combination with rubber, is much used as an electrical insulator. Asbestos cloth is used for acid filters in all sorts

of chemical processes, for the reason that no acid will eat it.

Asbestos is found in Italy and Canada, and rich deposits have recently been found in Wyoming, California and Montana. At present mines near Thetford, Quebec, are the principal source of the mineral, Canada producing about four-fifths of the world's supply.

ASBJORNSEN, *as byurn'sen*, PETER CHRISTEN (1812–1885), a distinguished Norwegian naturalist and folk-lore student. The popular tales, legends and fairy stories of his native country he collected and published as *Norwegian Folk Tales* and *Norwegian Fairy Tales and Folk Legends*. He also wrote works on zoölogical and other scientific subjects.

ASBURY, *az'bur y*, FRANCIS (1745–1816), the first bishop of the Methodist Episcopal Church ordained in America, was born in Handsworth, England. He came as a missionary from England in 1771 and was made general assistant to John Wesley. In 1777 the ministers of his Church, at a conference in Maryland, decided that they should return to Europe; Asbury, alone, chose to remain. He was unanimously elected bishop and consecrated by Doctor Coke in 1784, with a fixed salary of $64 per year. His annual travels extended from Canada to the Mississippi River, and in his biography it is stated that he traveled 270,000 miles during his life, mostly on horseback.

AS'BURY PARK, N. J. a summer resort town in Monmouth County, on the Atlantic Ocean, founded in 1880. It is sixty miles south of New York City and eighty miles east of Philadelphia. The city has about 200 hotels, which serve scores of thousands of visitors during the summer season. Sea Girt, where there is a national rifle range, is five miles distant. Population, 1910, 10,150; in 1917, 14,629 (Federal estimate).

ASCENSION, RIGHT, of a star, in astronomy, one of the factors in determining the location of a heavenly body. It corresponds nearly to longitude on the earth. The celestial equator divides the celestial sphere into northern and southern hemispheres. A certain point, the vernal equinox or first point in Aries, is established as a starting point. The right declination of any star is then found by measuring the angular distance on the celestial equator, from the fixed point to the foot of a circular perpendicular let fall from the star to the celestial equator. See DECLINATION.

ASCENSION DAY, the day on which the ascension of Christ is commemorated, often called *Holy Thursday*. It is a movable feast, always falling on the Thursday but one before Whitsuntide.

ASCETICISM, *as set'e sizm*, signified among ancient philosophers the mastery of the desires and passions. It exercised a great influence over the early Christians, who practiced fasting and self-denial. Later among the monks, it took the form of self-torture, penance and vows of poverty and celibacy; and even a disregard of personal cleanliness was considered as an aid to a holy life. The severity of the religion of the Puritans is an example of asceticism, and among the Protestants of to-day the objection to card-playing, the theater and dancing, as well as the teaching of total abstinence, vegetarianism and other restrictions, may be the result of ascetic tendencies. The Reformation, in its teaching that salvation was acquired through faith and not works, produced a great change in ascetic practices. See MONASTICISM.

ASCIDIAN, *as sid'ian*. See SEA SQUIRTS.

AS'GARD, in Scandinavian mythology, the home of the gods, corresponding to Olympus among the Greeks.

ASH, a genus of trees that shed the leaves in the winter, have imperfect flowers, and a seed-vessel prolonged into a thin wing at the apex. There are many species, chiefly native to Europe and North America. The ash is one of the most useful trees, on account of its hard, tough wood and the rapidity of its growth. There are many varieties of it, as the weeping ash, the curled-leaved ash and the entire-leaved ash. The flowering, or manna-ash, is a native of the south of Europe and Palestine. It yields the substance called manna, which is obtained by making incisions in the bark, when the juice exudes and hardens. Among the American species are the valuable white ash, with lighter bark and leaves; the red or black ash, with a brown bark; the black ash, and the blue ash. Several species not properly of this genus are popularly called ash. See MOUNTAIN ASH; PRICKLY ASH.

ASH, or **ASHES**, what remains after a substance is burned. The term is usually applied to the mineral residue obtained on burning wood, coal, plants and the like. From the ashes of seaweeds are extracted

bromine and iodine. Wood ashes are a source of potash, which is used as a fertilizer.

ASHANTI, *a shahn'te*, a district in West Africa which has been a part of the Gold Coast colony since 1896. Formerly, when the latter occupied only a narrow strip along the Atlantic Ocean, Ashanti was a small, independent negro kingdom north of it. Now its location is south of the central part of the Gold Coast (see map, AFRICA), and it is about 20,000 square miles in area. The natives number about 290,000, and they practice polygamy. Local government is controlled on the tribal plan, each tribe having its headman. Ancestor worship and nature worship predominate.

The country is rich in forest and the soil is very fertile. The natives raise yams, fruit, grains and copal, and there is a considerable rubber industry. They are skilled in some branches of metal work and in weaving.

Ashanti is a British possession. Since about 1826 England's influence has been paramount, and it has been undisputed since 1872, when Holland ceded the Gold Coast to Britain. Numerous native insurrections have occurred, but there has been tranquillity since 1901.

ASH'BURTON, ALEXANDER BARING, Lord, (1774–1848), a prominent English financier and diplomat. For many years before the death of his father he was in the firm of Baring Brothers, and on his father's death he became its head. While on a trip to the United States he met and married Anne Bingham, the daughter of a United States Senator; and when, in 1842, the disagreement between the United States and Great Britain in regard to the northeast and northwest boundary lines had reached a crisis, Ashburton, by reason of his American marriage and his familiarity with American ideas, was appointed to attempt the readjustment of the difficulty. The Webster-Ashburton Treaty which was negotiated averted the possibility of war. See WEBSTER-ASHBURTON TREATY; WEBSTER, DANIEL.

ASHEVILLE, *ash'vil*, N. C., a famous all-the-year health and pleasure resort, the county seat of Buncombe County, 2,250 feet above sea level. The city is on the Southern Railway, 210 miles west of Raleigh, the state capital. The railroad has four lines radiating from Asheville, and here are division offices and repair shops.

The city's chief claim to fame is in the surrounding scenery. Within a hundred miles are over sixty mountain peaks; Mount Mitchell, the highest point in the eastern United States, is reached by rail. The industries include the making of caskets, ready-built houses, cotton cloth factories and mica works. There are four parks, a public library and three hospitals. Located here also are a Normal and Collegiate school, Saint Genevieve's College, Home Industrial School, Asheville School for Boys and Asheville School for Girls and several other private educational institutions. The commission form of government was adopted in 1915. The town was founded in 1797 and was incorporated as a city in 1883. Population, 1910, 18,762; in 1917, 25,656 (Federal estimate).

ASHLAND, KY., a city in Boyd County, 144 miles northeast of Cincinnati, on the Chesapeake & Ohio, the Norfolk & Western and other lesser lines of railroad. It is a manufacturing city, claiming the largest payroll to employes of any city of its size in the United States. Iron, steel and coke are the principal manufactures. A new Federal building, erected in 1917, cost $100,000. Population, 1910, 8,688; in 1917, 12,195 (Federal estimate).

ASHLAND, WIS., founded in 1854, a city in the northern part of the state and the county seat of Ashland County, on Chequamegon Bay, Lake Superior. Four railroad branch lines terminate here—the Chicago & Northwestern, the Minneapolis, Saint Paul & Sault Sainte Marie, the Northern Pacific and the Chicago, Saint Paul, Minneapolis & Omaha. The city is 280 miles northwest of Milwaukee. There are great ore docks fronting the fine harbor, and the city also has large lumber interests, paper mills, steel works and blast furnaces. A machine shop of the Chicago & Northwestern is located here.

Ashland has Sacred Heart Convent, Northern College and North Wisconsin Academy, a public library and two hospitals. Since 1913 it has been governed on the commission plan. Population, 1910, 11,594; in 1918, about the same.

ASHTABULA, *ash ta bu'lah*, OHIO, founded in 1805, is in Ashtabula County three miles from Lake Erie on Ashtabula River, fifty-four miles northeast of Cleveland and 129 miles southwest of Buffalo. It is served by the New York Central, the Pennsylvania

and the New York, Chicago & Saint Louis railroads, and also by electric roads. It is a lake port of importance, with great capacity for unloading iron ore. The city has ship yards, car repair shops, tanneries and large greenhouses for raising vegetables in winter. There is a Carnegie Library and a hospital. The commission form of government has been in effect since 1916. Population, thirty per cent Swedes, Finns and Italians, was 18,266 in 1910; in 1917, 22,008 (Federal estimate).

ASH WEDNESDAY, the first day of Lent, so called from a custom in the Western Church of sprinkling ashes on the heads of penitents admitted to penance that day. The custom is said to have originated with Gregory the Great. In the Roman Catholic Church the ashes are consecrated on the altar, sprinkled with holy water and then cast on the heads of the clergy and people, the priest saying in Latin, "Remember that thou art dust and to dust thou shalt return."

ASIA, the greatest of the continents in area, almost five times as large as Europe, and two and a half times as large as North America. It contains 17,470,282 square miles and more than 842,000,000 people, an average of forty-eight to the square mile. Half of the people are in China alone, where the population is dense. From the west to east its length is 5,000 miles, and from north to south it is 5,100 miles. Asia represents thirty per cent of the world's land area, and it contains fifty-one per cent of its population.

The adjoining islands include the Japan Islands, the Philippines and the large group usually known as the East Indies, in which are Sumatra, New Guinea and Borneo, among the largest islands of the world. This archipelago is subdivided into numerous smaller groups. The important isolated islands are Formosa and Hongkong, off the coast of China, and Ceylon, at the southern extremity of India. The continent is separated from Europe by a mere depression, extending from the Caspian Sea, northward to the Ural Mountains, which complete the boundary. During the early part of the Cenozoic Era this portion of the continent was submerged, and Europe and Asia formed two separate continents. Asia is separated from a portion of Africa by the Red Sea and the Strait of Bab-el-Mandeb and is joined to it by the Isthmus of Suez, which is about one hundred miles wide.

Political Divisions. At the outbreak of the World War Asia was made up of several independent and semi-independent countries, the Asiatic part of the Turkish Empire, and a large number of colonies and dependencies of the European nations. These were divided as follows:

Asiatic Turkey included Asia Minor, Armenia, Kurdistan, Mesopotamia, Syria and part of Arabia; total area, about 700,000 square miles; population, about 20,000,000. During the war the independent kingdom of Hedjaz, in Arabia, was proclaimed (see Arabia), and practically all of Asiatic Turkey came under the control of the allies. The future status of the Turkish Empire was one of the problems of the Peace Conference and later of the League of Nations. It was expected that Armenia would be made an independent nation, all of Arabia be freed from Turkish rule, and portions or all of Mesopotamia and Syria be made protectorates of certain allied nations.

Independent Countries of Asia. These are (1) the Chinese republic, including China proper, Mongolia, Manchuria, Chinese (or East) Turkestan and Tibet, with an area of about 4,278,000 square miles and a population of nearly 330,000,000; (2) the Japanese Empire, covering 260,738 square miles and having a population of 77,240,000; (3) Siam, with an area of about 195,000 square miles and a population of nearly 9,000,000; (4) Persia, with an area of 628,000 square miles and a population estimated at 9,500,000; (5) Oman, in Arabia, with an area of 82,000 square miles and a population estimated at 500,000; Nepal, in the Himalayas, and a few other small states.

Semi-Independent Countries. These are Afghanistan (225,000 square miles, population, 5,000,000) and Baluchistan (54,288 square miles, population, 414,412), both under British domination. Chosen (formerly Korea) was annexed by Japan in 1910 and lost its former status of an independent country.

Islands. Most of the East Indies belong to the Netherlands. The remainder were divided before the World War between Great Britain, Germany and the United States. Germany lost all its Asiatic islands in 1915.

Colonies and Dependencies. The European nations at the outbreak of the World War controlled the following:

France: Annam, Cambodia, Cochin-China, Tonking and Laos, with an area of 256,196 square miles and an estimated population of about 17,000,000; and 196 square miles in India, with an estimated population of 269,000.

ATLANTIC OCEAN
NORTH SEA
BALTIC SEA
SWEDEN
NORWAY
SPITZBERGEN
ARCTIC
NOVAYA ZEMLYA
KARA SEA
FRANZ JOSEF
RUSSIA
Petrograd
Moscow
Warsaw
Kiev
Odessa
Astrakhan
Saratov
Volga R.
Ural R.
Orenburg
Uralsk
Samara
WESTERN SIBERIA
Tobolsk
Omsk
Tomsk
Barnaul
Akmolinsk
Semipalatinsk
Turgai
ARAL SEA
Aralsk
Petropavlovsk
Kustanai
Chelyabinsk
Surgut
Obdorsk
Berezov
Irtish R.
Ob R.
Yenisei R.
Minusinsk
Krasnoyarsk
Kansk
Irkutsk
Bratsk
Kuda
Urumtsi
Aksu
Kuchar
Yarkand
Kashgar
EASTERN TURKESTAN
Khotan
Cherchen
Kuen Lun Mts.
Bakha Narur
Gartok
TIBET
Tengri Nor
Dhamalgiri
Saharanpur
Meerut
Delhi
Bikaner
Mutra
Agra
Lucknow
Gorakhpur
Benares
Patna
Gaya
Allahabad
Jubbulpore
Burdwan
Chandernagor
Serampur
Cuttack
Puri
INDIA
Jodhpur
Ajmere
Jaipur
Gwalior
Jhansi
Bhopal
Indore
Nagpur
Bombay
Poona
Sholapur
Kolapur
Panjim
GOA (Port.)
Karwar
Haidarabad
Visayapatam
Yanaon (Fr.)
Masulipatam
Nellore
Madras
Pondicherry (Fr.)
Karikal (Fr.)
Mangalore
Cananore
Mahe (Fr.)
Calicut
Cochin
Tuticorin
Trincomali
CEYLON
Kandy
Colombo
Pt. de Galle
Madura
Negapatam
Tranquebar (Dan.)
Cuddalore
Pondicherry
Arcot
Vellore
Bangalore
Salem
Coimbatore
Erode
Karur
Trichinopoly
Tanjore
Pudukota
Ramnad
Gulf of Manaar
Comorin C.
MALDIVE IS.
LACCADIVE IS.
ARABIAN SEA
INDIAN OCEAN
EQUATOR
Hamadan
Kermanshah
Kasvin
Ispahan
Yezd
TEHERAN
Meshed
Tabriz
Baku
Ashkabad
Merv
Bokhara
Khiva
Tashkend
Samarkand
Khokand
Andijan
Fergana
Kuldja
Kashgar
Yarkand
Herat
KABUL
Kandahar
Quetta
Khelat
Shikarpur
Karachi
Jask
Bender Abbas
Bushire
Shiraz
Kerman
Laristan
Lingah
Muscat
Maskat
Dehna Desert
Ahkaf Desert
Nefud Desert
Syrian Desert
Mesopotamia
Bagdad
Mosul
Aleppo
Damascus
Hamah
Homs
Palmyra
Port Said
Suez
Cairo
Alexandria
Belbeis
Ismailia
Medina
Mecca
Hail
Bereida
Riad
Jidda
Yambo
Kunfida
Loheia
Hodeida
Mocha
Beit el Fakih
Zebid
Hais
Taiz
Aden
Hadramaut
Mukalla
Kuria Muria Is.
Masirah
Hasek Had
Socotra
Gulf of Aden
Addis Abeba
Abyssinia
Eritrea
Massaua
Suakin
Khartum
Berber
Dongola
Wadi Halfa
Assuan
Luxor
Keneh
Siut
Girgeh
Libyan Desert
Arabian Desert
Nubian Desert
Egypt
Turkey in Asia
Persia
Arabia
Afghanistan
Baluchistan
Sind
Rajputana
Central India
Deccan
Mysore
Hyderabad
Bombay
Madras
Ceylon
Somali Coast
French Somali Coast
Italian Somaliland
British East Africa
German East Africa
Dar-es-Salaam
Mombasa
Zanzibar
Lake Victoria Nyanza
Lake Tanganyika
Lake Nyasa
Lake Rudolf
Lake Albert
Lake Aral
Caspian Sea
Black Sea
Mediterranean Sea
Red Sea
Persian Gulf
Gulf of Oman
Gulf of Aden
Gulf of Suez
Gulf of Akaba
Gulf of Cambay
Gulf of Manaar
Hammond's 8 x 11 Map of Asia.
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A 0 B 10 C 20 D 30 E 40 F G H I
E 40 F 50 G 60 H 70 I Longitude 80 East J
1 2 3 4 5 6 7 8 9 10 20 30 40

ASIA
ENGLISH STATUTE MILES
0 200 400 600 800 1000
KILOMETERS
0 200 400 600 800 1000 1200 1400 1600
EQUATOR
TROPIC OF CANCER
PACIFIC OCEAN
JAPAN
EMPIRE OF
SEA OF OKHOTSK
BERING SEA
ALEUTIAN IS.
KOMANDORSKI IS.
KURIL IS.
SAKHALIN
SIMUSIR
PARAMUSHIR
ONNEKOTAN
YEZO
HONSHU
SHIKOKU
KIUSHU
RIU KIU IS.
BONIN IS.
(To Jap.)
MARIANNE IS.
GUAM
(To U.S.)
CAROLINE IS.
(To Ger.)
PELEW IS.
(To Ger.)
PHILIPPINE ISLANDS
LUZON
MINDORO
PANAY
NEGROS
SAMAR
LEYTE
PALAWAN
MINDANAO
SULU SEA
SULU ISLANDS
CELEBES SEA
SOUTH CHINA SEA
EAST CHINA SEA
YELLOW SEA
FORMOSA
BASHI STR.
BATANES IS.
SABUYAN IS.
TOKYO
Yokohama
Kyoto
Osaka
Nagoya
Nagasaki
Niigata
Toyama
Kanazawa
Hakodate
Aomori
Sendai
Aniwa
Esashi
Wakkanai
Korsakovsk
Petropavlovsk
Ust-Kamchatsk
Bolsheretsk
Okhotsk
Ayan
Nikolaevsk
Vladivostok
Gensan
Fusan
Seoul
Chemulpo
Mukden
Changchun
Kirin
Hunghun
Antung
Newchwang
Dairen
Port Arthur
Tientsin
PEKING
Kalgan
Paoting
Taiyuen
Tsinan
Tsingtau
Kiaochau
Pingyang
Yenchau
Ninghia
Yenchan
Lanchau
Kinggang
Singan
Hankau
Shanghai
Hangchau
Nanking
Chinkiang
Yangchau
Hwaian
Hwaiking
Suchau
Tsingkiang
Kiukiang
Wuchang
Hanyang
Ichang
Shasi
Yochau
Changsha
Siangtan
Hengyang
Kweiyang
Yunnan
Yunnanfu
Fuchau
Amoy
Swatow
Canton
Hongkong (Br.)
Macao (Port.)
Kwangchau (Fr.)
Wuchau
Nanning
Lungchau
Pakhoi
Haiphong
HANOI
Namdinh
Gulf of Tonkin
HAINAN
Hoihau
Klungchau
Vinh
Kwang-binh
HUE
Tourane
Kwangngai
Phuyen
Binh-dinh
Nhatrang
Phanrang
Phanthiet
Baria
Saigon
Cholon
Mytho
Vientiane
Korat
Ubon
Bassak
Pakpoi
Chantabun
Bangkok
Paknam
Petchaburi
Tenasserim
Mergui
Victoria Pt.
Tavoy
Moulmein
Martaban
Rangoon
Bassein
Akyab
Sandoway
Thayetmyo
Prome
Toungoo
Pegu
Mandalay
Bhamo
Myitkyina
Lashio
Kengtung
Kengtung
Taunggyi
Kyaingtong
Monglong
Monglong
Kiangrung
Kiangrung
Kiangrung

RELIEF MAP OF ASIA

Germany formerly held a lease of Kiao-chau (which see), but this dependency was seized by Japan in 1914. In 1919 its eventual restoration to China was guaranteed.

Great Britain: British India and the Native States of India, Aden (a peninsula on the Arabian coast), the Straits Settlements, Hongkong and adjoining leased territory, the Federated Malay States and numerous islands. The British Asiatic possessions cover about 1,875,000 square miles and have a population of about 322,000,000. (See table in article British Empire.)

Portugal: Macao, in China; Gjoa and two minor possessions, in India. Area, 1,642 square miles; population, about 600,000.

Russia: The possessions of the former Russian Empire were Siberia, Trans-Caucasia, West Turkestan, Trans-Caspia and the vassal states of Bokhara and Khiva. Area, about 6,400,000 square miles; population, about 30,000,000.

The People. Asia is mainly peopled by the Caucasian and Mongolian races. To the former belong the Aryan, or Indo-European, and the Semitic races, both of which mainly inhabit the southwest of the continent; to the latter belong the Malays and Indo-Chinese in the southeast as well as the Mongolians proper, Chinese and Japanese, occupying nearly all the rest of the continent. To these may be added certain races of doubtful affinities, as the Dravidians of southern India, the Cingalese of Ceylon, the Ainos of Yesso and some negro-like tribes called Negritos, which inhabit Malacca and the interior of several of the islands of the Eastern Archipelago.

Surface and Drainage. Asia is the land of the most extensive plains, the greatest plateaus and the highest mountains in the world. The continent consists of a vast plateau in the interior, surrounded by lowlands. From this plateau numerous mountain ranges rise and extend in nearly all directions, though the prevailing trend is east and west. Most of the ranges are upon the edges of the plateau; hence they have a short and somewhat gentle slope upon the side facing the interior of the continent and a long, steep slope upon the opposite side.

The great plateau reaches its greatest elevation in Tibet, where its mean altitude is about 15,000 feet. It is bounded on the south by the Himalayas, having an extent of 1,500 miles and a mean elevation of 18,000 feet, with peaks ranging from 18,000 to 29,000 feet. These are the loftiest mountains in the world. On their southern slope they descend abruptly to the plains of the Indus and the Ganges. The Plateau of Pamir forms the western boundary of the Plateau of Tibet. Pamir, though situated 1,000 miles southwest of the center of the continent, seems to be the center from which the great mountain systems radiate, and it is often called by the natives "the roof of the world." From it the Himalayas extend to the southwest and the Hindu Kush to the northwest, and the Thian-Shan on the north have an east and west trend. These mountains are highest at the western extremity, where they attain an altitude of about 18,000 feet. Their mean elevation is from 10,000 to 12,000 feet. The system consists of a number of broken ranges whose extent is about 1,500 miles.

Near the eastern extremity and between two of these ranges is a small valley known as the Turfan depression. This little valley descends to sea level and is about three hundred miles long by one hundred miles wide. It is surrounded upon all sides by higher lands, and the reason for its formation is not easily determined. To the northeast of the Thian-Shan are the Altai and their extensions, the Yablonoi and Stanovoi, the last extending to the extreme northeastern point of the continent, and the combined ranges forming the boundary between the great central plateau and the Siberian plain. The extent of these mountains is about 3,000 miles, and they diminish in altitude from the west toward the northeast. Between the Altai and Yablonoi on the north and the Kingan on the east, which extend north and south, is the Desert of Gobi.

North of the Himalaya and traversing the Plateau of Tibet are the Kuen-Lun and other mountain ranges, and to the east of the plateau are a number of nearly parallel ranges whose general trend is from northwest to southeast. The prolongation of some of these ranges forms Indo-China and the Malay Peninsula. Kamtchatka and Chosen are also formed by the projection of coast ranges, a number of which are approximately parallel to the northern portion of the coast.

West of Pamir is the Plateau of Iran, bounded on the north by the Hindu Kush and the Elburz Mountains, which have an altitude of from 25,000 feet in the Hindu Kush to 18,500 in the Elburz. On the south of the plateau are the Zagros, a low range scarcely exceeding 6,000 feet and trending to the northwest until they meet the Elburz in the region between the Caspian and Black

Cocoanut Palm and Fruit

Mango

Banana

Indigo

Sago Palm

Ginger Plant

Palmyra Palm

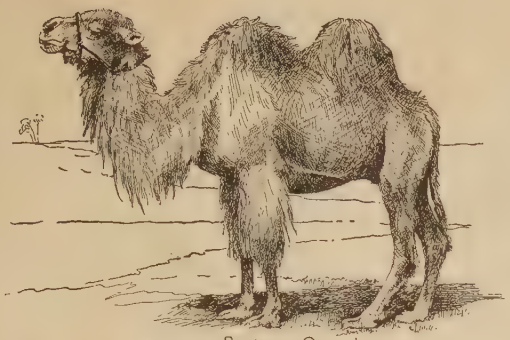
seas. Mount Ararat, famous in Bible history, is one of the prominent peaks in this region. To the west of these ranges is the plateau of Asia Minor, which has an altitude of about 6,000 feet and upon which the Taurus Mountains rest. North of the Caspian Sea are the Urals, a range of low mountains extending north and south and forming a portion of the boundary between Asia and Europe. The lowlands consist of the great depression which forms a part of the division between Asia and Europe, and in which are found the Caspian and Aral seas and a few smaller salt lakes; the great Siberian plain, extending from the Altai to the Arctic coast and having an area which exceeds that of all Europe, and the lowlands along the eastern and southern coasts and the flood plains of the great rivers, such as the Yang-tse-Kiang, Hoang-ho, Ganges and Indus.

Rivers. Some of the largest rivers of Asia flow northward to the Arctic Ocean—the Obi, the Yenisei and the Lena. The Hoang-ho, the Yang-tse and the Amur are the chief of those which flow into the Pacific. The Ganges, Brahmaputra, Irawaddy and Indus empty into the Indian Ocean. The Persian Gulf receives the united waters of the Euphrates and the Tigris. There are several systems of inland drainage, large rivers falling into lakes which have no outlet. The flood plains of the rivers flowing into the Pacific and Indian oceans are among the most fertile regions in the world.

Lakes. The largest lake of Asia is the Caspian Sea, which receives the Kur from the Caucasus (with its tributary, the Aras, from Armenia), and the Sefid Rud and other streams from Persia (besides the Volga, from European Russia, and the Ural). The Caspian lies in the center of a great depression, being eighty-three feet below the level of the Sea of Azov. East from the Caspian is the Sea of Aral, which, like the Caspian, has no outlet, and is fed by the rivers Amu-Darya (Oxus) and Syr-Darya. Still farther east, to the north of the Thian-Shan Mountains, and fed by the Ili and other streams, is Lake Balkash, also without an outlet and very salt. Other lakes having no communication with the ocean are Lob-Nor, in the Desert of Gobi, receiving the river Tarim and the Dead Sea, far below the level of the Mediterranean, and fed by the Jordan. The chief fresh-water lake is Lake Baikal, in the southern part of Siberia, a mountain lake from which the Yenisei draws a portion of its waters.

Mineral Resources. The mineral resources of Asia are very extensive, though the most valuable of them have not yet been developed. The southern portion of the continent has for centuries been famous for its precious stones, such as the diamonds of Golconda, the sapphires of Ceylon, the rubies of Burma and the jade of Turkestan. In the Malay peninsula and adjoining islands are found the richest tin mines of the world. Copper and mercury occur in Japan, coal is found in large quantities in China, and to some extent in Japan, while throughout the interior are numerous deposits of iron ore which appear to be of great value. In the eastern portion of Siberia are valuable gold mines, and the Ural Mountains contain considerable gold and are the most important source of platinum in the world. Around the Caspian Sea, and in Burma and Sumatra, are regions from which petroleum is obtained. The vicinity of the Caspian Sea yields more than the oil fields of the United States. In general, the lowlands near the coast and along the rivers are covered with a rich soil, as is a large portion of the great Siberian plain; but much of the interior is unfertile, either because of its high altitude and consequently cold climate, or for lack of sufficient moisture.

Climate. Every variety of climate may be experienced in Asia, but as a whole the continent is marked by extremes of heat and cold and by great dryness, this in particular being the case with vast regions in the center of the continent and distant from the sea. The great lowland region of Siberia has a short but very hot summer, and a long intensely cold winter, the rivers and their estuaries being fast bound with ice, and at a certain depth the soil being frozen all the year round. The northern part of China, to the east of Central Asia, has a temperate climate with a warm summer, and in the extreme north a severe winter. The districts lying to the south of the central region, comprising the Indian and Indo-Chinese peninsulas, Southern China and the adjacent islands, present the characteristic climate and vegetation of the southern temperate and tropical regions, modified by the effects of altitude. Some localities in Southeastern Asia have the heaviest rainfall anywhere



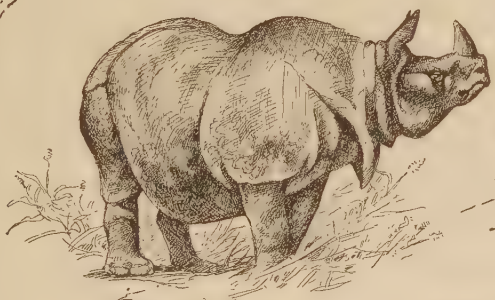
Bactrian Camel

Polar Bear

Sable

Tiger

Peacock



Indian Rhinoceros

Orang-utan

Zebu

Indian Elephant

known. In Assam it is as great as 800 inches —about seventy feet—a year. As the equator is approached, the extremes of temperature diminish till at the southern extremity of the continent they are such as may be experienced in any tropical country. Among climatic features are the monsoons of the Indian Ocean and the eastern seas and the cyclones or typhoons, which are often very destructive. See CLIMATE; WIND.

Vegetable Life. The plants and animals of northern and western Asia generally resemble those of similar latitudes in Europe, differing more in species than in classes. The principal mountain trees are the pine, larch and birch; the willow, alder and poplar are found in lower grounds. In the central region European species reach as far as the western and central Himalayas, but are rare in the eastern. They are here met by Chinese and Japanese forms. The lower slopes of the Himalayas are clothed almost exclusively with tropical forms. Higher up, between 4,000 and 10,000 feet, are found all the types of trees and plants that belong to the temperate zone, including extensive forests of cone bearing trees. The southeastern region including India, the Eastern peninsula and China, with the islands, contains a vast variety of plants useful to man and having here their original habitat, such as sugar-cane, rice, cotton, indigo, pepper, cinnamon, cassia, clove, nutmeg, banana, cocoanut, areca and sago palm, the mango and many other fruits, with plants producing a vast number of drugs, besides caoutchouc and gutta-percha. The forests of India and the Malay Peninsula contain oak, teak, sal and other timber woods, besides bamboos, palms and sandal-wood. The Palmyra palm is characteristic of southern India, while the talipot palm flourishes on the western coast of Hindustan, Ceylon and the Malay Peninsula.

The cultivated plants of India and China include wheat, barley, rice, maize, millet, sorghum, tea, coffee, indigo, cotton, jute, opium and tobacco. In North China and the Japanese Islands occur large numbers of trees that shed their leaves annually, such as oaks, maples, limes, walnuts, poplars and willows. In Arabia and the warmer valleys of Persia, Afghanistan and Baluchistan, aromatic shrubs are abundant. Over large parts of these regions the date-palm flourishes and affords a valuable article of food. Gum-producing acacias are, with the date-palm, the commonest trees in Arabia.

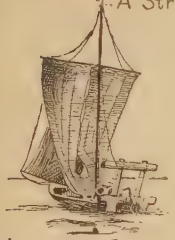
Animals of Asia. Nearly all the mammals of Europe occur in northern Asia, with numerous additions. Central Asia is the native land of the horse, the ass, the ox, the sheep and the goat. Both varieties of the camel, the single and the double humped, are Asiatic. To the inhabitants of Tibet and the higher plateaus of the Himalayas, the yak is what the reindeer is to the tribes of the Siberian plain, almost their sole wealth and support. The elephant, of a different species from that of Africa, is a native of tropical Asia. The Asiatic lion, which inhabits Arabia, Persia, Asia Minor and some parts of India, is smaller than the African species. Bears are found in all parts, the white bear in the far north, and other species in the more temperate and tropical parts. The tiger is the most characteristic of the larger Asiatic carnivora. Its habitat extends from Armenia across the entire continent, excepting, however, the greater portion of Siberia and the high table-land of Tibet. In southeastern Asia and the islands the rhinoceros, buffalo, ox, deer, squirrels and porcupines are found.

In birds, nearly every order is represented. Among the most interesting forms are the hornbills, the peacock, the Impey pheasant, the tragopan, or horned pheasant, and others of this family. It was from Asia that the common domestic fowl was introduced into Europe. The tropical parts of Asia abound in monkeys, of which the species are numerous. Some are tailed, others, such as the orang, are tailless, but none has a grasping tail like that of the American monkey. In the Malay Archipelago the animals which bear their young in an external pouch, so characteristic of Australia, first occur in the Moluccas and Celebes, while various mammals common in the western part of the Archipelago are absent. A similar transition toward the Australian type takes place in the species of birds. Of marine mammals the dugong is peculiar to the Indian Ocean; in the Ganges is found a peculiar species of dolphin. At the head of the reptiles stands the Gangetic crocodile, frequenting the Ganges and other large rivers. Among the serpents is the cobra de capello, one of the most deadly snakes in existence, and there are also large boas and pythons, besides sea and fresh-water snakes. The seas and rivers produce a great variety of fish.

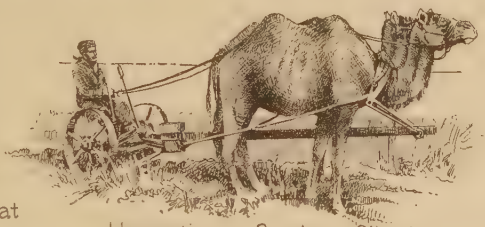
A Street in Canton

Shopping in Japan

How Eggs are Sold in Korea



Japanese Sailboat



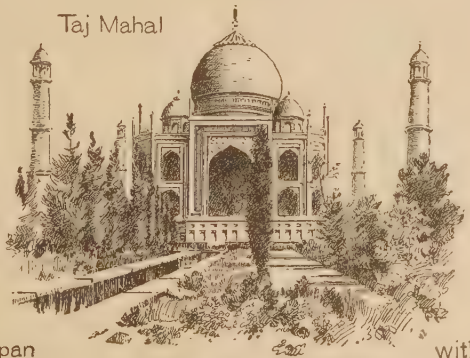
Harvesting in Southern Siberia

Home of a Filipino

Arab Encampment

No Baby Carriages in Japan

Taj Mahal



Burmese Woman, with Fashionable Neck Rings

History. Asia is generally regarded as the cradle of the human race. It possesses the oldest historical documents, and, next to Egypt, the oldest historical monuments in the world. The Old Testament contains the earliest records of any nation which we have in the form of a distinct narrative. The period at which these were written is supposed to be about 1,500 years before the Christian Era; but in Babylonia and Assyria, as well as in Egypt, civilization had made great advances long before this time.

The earliest seat of the Aryan race was probably in the valley of the Tigris and Euphrates rivers, whence they emigrated to the southeast and southwest, finally occupying northern India, Persia and other parts of western Asia, and spreading into Europe. China possesses an authentic history extending back to about 1000 B. C. and legends covering a long period preceding this date. Cyrus (559 B. C.) extended the Persian Empire westward to the Mediterranean, while his son Cambyses added to this Egypt and Libya. In 330 B. C. Alexander conquered Persia and brought it under his sway, but upon his death the Empire was divided into a number of separate kingdoms, which in time were dissolved by the Roman Empire. At the time the Roman power was at its greatest height, the birth of Christ occurred.

In the seventh century A. D. occurred the rise of the Mohammedans. This people soon obtained control of Persia and Syria and extended their sway into Egypt. In A. D. 1000 Mahmud conquered India and established his rule. About the same time the dynasty of the Seljuk Tartars was established in Western Asia, embracing Aleppo, Damascus and Iconium, and was distinguished for its struggle with the Crusaders. The Ottoman Empire was founded in 1300. A little before this Genghis Khan, an independent Mongol chief, made himself master of Central Asia, conquered northern China and overran Turkestan. From this beginning the Mongols and Mongol Tartars practically overran all of northern and western Asia, but the Ottoman Empire soon recovered from the catastrophe, and the Mongols were expelled from the West in 1453.

The Russian Cossacks conquered Siberia in the latter part of the sixteenth century, and about one hundred years later the Russians began settlements in the Caucasus. These regions have ever since remained under Russian control. In 1498 occurred the voyage of Vasco de Gama to India, and following this the Spanish, Dutch, French, Portuguese and British nations established trading posts and began settlements in different sections along the coast or on the neighboring islands. During the nineteenth century Great Britain controlled all India and subjected all of that region to the influence of western government and civilization. She was followed by France in Indo-China. Germany has attempted to gain foothold in the Chinese domain and other localities, though without much success; but Russia has gained possession of a rich territory in Siberia and adjacent lands at the south. The future of large areas in Asia was in doubt in 1919. Japan is looking with envious eyes beyond Korea, which it now owns and has renamed Chosen, and German influence, even under the new government, is at work in parts of Siberia.

Related Articles. The geography, government, history, industries and people of each political division are treated in these volumes in the articles on the respective countries and states. Accompanying these articles are lists of related topics. For more general information see the following titles:

Alexander the Great	Crusades
Arctic Ocean	Indian Ocean
Asia Minor	Levant
Assyria	Malay Archipelago
Babylonia	Mediterranean Sea
Brahmanism	Mesopotamia
Buddhism	Mohammedanism
Christianity	Palestine
Confucius	Rice
Cotton	World War

ASIA MI'NOR, the most westerly portion of Asia, the peninsula lying west of the upper Euphrates and forming part of Asiatic Turkey. In ancient times its chief divisions were Pontus, Paphlagonia, Bithynia, Mysia, Lydia, Caria, Lycia, Pisidia, Pamphylia, Cilicia, Isauria, Cappadocia, Galatia, Phrygia and Lycaonia. The modern name of Asia Minor is Anatolia. It has an estimated area of 196,000 square miles, which is over twice that of Wyoming, and a population of about 9,000,000, of whom over 7,000,000 are Mohammedans. The region is divided politically into several Turkish vilayets (provinces).

ASP, a species of viper found in Egypt, resembling the cobra de capello or spectacle-serpent of the East Indies, and having a very venomous bite. When approached or disturbed, it elevates its head and body, swells out its neck and appears to stand erect to attack the aggressor. The balancing motions made by it in the endeavor to maintain the

erect attitude have led to the employment of the asp as a dancing serpent by the African jugglers. Cleopatra is said to have committed suicide by means of an asp's bite. The name asp is also given to a viper common on the continent of Europe, and to the puff-adder of South America.

ASPAR'AGUS, a plant, the young shoots of which, cut soon after they come from the ground, are a favorite vegetable. Asparagus is extensively grown in America, where the edible part is used both as a salad and as a vegetable dish.

The plants should be allowed to grow three years from the seed before they are cut; after that, for ten or twelve years, they will continue to afford a regular annual supply. The beds are protected by straw or litter in winter. The full-grown plant has a beautiful feathery top, shaped like a miniature tree, and it bears small flowers and bright red fruits. Some varieties are cultivated for ornament and are incorrectly known as ferns.

ASPASIA, *as pa'she a*, a celebrated woman on ancient Greece. She was born at Miletus, in Ionia, but passed a great part of her life at Athens, where her house was the general resort of the most distinguished men in Greece. She won the affection of Pericles, who united himself to her as closely as he was permitted by the Athenian law, which declared marriage with a foreign woman illegal. She had a son by Pericles, who was made legitimate by a special decree of the people.

AS'PEN, or TREMBLING POPLAR, a species of poplar native to Great Britain and to most mountainous regions throughout Europe and Asia. It is a beautiful tree, it grows rapidly, is extremely hardy, and has nearly circular toothed leaves, smooth on both sides and attached to footstalks so long and slender as to be shaken by the slightest wind. The light, porous, soft, white wood is useful for making bowls, trays, pails and charcoal.

ASPHALT, *as'falt*, a mineral, found in but few places in the world and the best material known for street paving. Although clearly recognized chemically as one of the bitumens, it is in many respects a mysterious substance, and much of its history is yet to be disclosed. It is black or brown in its natural state, and is brittle and glossy.

The word *bitumen* may be defined as a general term for a class of minerals occurring in nature which are soluble in chloroform and other neutral liquids. They all consist of compounds of carbon and hydrogen, but also often contain compounds of nitrogen, sulphur, oxygen, and, in the solid form, iron and alumina. While bitumen (which see) may be gaseous, liquid or solid, and relatively pure or mixed solid materials to form rocks, all asphalts belong to the solid forms. The processes by which asphalt is formed by nature are still unsettled by geologists and chemists. That organic matter enters into the processes is generally admitted, but the manner of it is a technical problem yet unsolved.

Where Asphalt is Found. The ancients gathered their asphalt from the Red Sea, which to this day produces a small quantity. They used it in construction of palaces in Nineveh and Babylon, and it was also one of the materials in the Tower of Babel. The largest proportion of the world's asphalt today is secured from Trinidad, Venezuela and Cuba. The United States has laid over 50,000,000 square yards of asphalt pavement, and fully three-fourths of it came from Trinidad. There are also deposits in California and Utah and in the Philippine Islands.

Trinidad's Asphalt Lake. The largest asphalt deposit in the world is in Trinidad, in what is known as Pitch Lake. The supply is apparently exhaustless, as daily more comes up from below to fill the space occasioned by removals. This deposit occupies a bowlike depression of about 115 acres, which is probably the center of an extinct volcano. The center of the lake is not quite a mile from the Gulf of Paria and is about 135 feet above the level of the sea; its contents are of remarkable uniformity, and its surface is in constant motion, there appearing at times what may be termed currents and eddies. The middle of this wonderful lake is about one foot higher than the edges, this relation being maintained, although the body as a whole has been lowered by the constant removal of material. There is an overflow from the lake to the sea through a crevice in the rim, and this stream is from fifteen to eighteen feet deep, but beneath this stream is a ravine still filled with asphalt, which seems to have no limit to it. The depth of the lake at Trinidad is supposed to be about 100 feet, although the actual bottom of the crater-like depression has never been reached. The pitch itself can be picked up and molded without soiling the hands.

As Paving Material. Crude asphalt must undergo a refining process before it can be used for paving. Three tons of Trinidad cement is reduced to two tons in the refining process. It is then thoroughly mixed with sand and lime in certain proportions. The process of preparing the street for its covering of paving material is described in the article PAVEMENT.

ASPHODEL, *as'fo del,* a genus of lilylike plants, with fleshy roots and flowers arranged in long, loose clusters. The asphodels are fine garden plants, natives of Southern Europe. The *king's spear* has yellow flowers, blossoming in June. The white asphodel was a symbol of death among the ancient Greeks, who believed that the meadows of Hades, the under world, were covered with its pale blossoms. The source of this superstition was probably the fact that in Greece the asphodel is a common weed of barren and desert places, thriving especially well in the vicinity of tombs. The bog asphodel of England and the wild asphodel of New Jersey are unrelated species. The asphodel of English poets is the daffodil.

ASPHYXIATION, *as fix e a'shun,* the condition which results when oxygen is kept away from air-breathing animals. In persons suffering from asphyxia, the blood is not purified and congests in the arteries, causing death if there is no relief. The restoration of asphyxiated persons has been successfully accomplished a long time after death had apparently come, so that the work of restoration should be persistently followed without discouragement. The attempt should be made to retain the heat of the body and to secure the inflation of the lungs, as in the case of the apparently drowned. For a trustworthy method of restoration, see the article DROWNING. A mechanical device such as a pulmotor should never be waited for, as efforts at restoration must begin as soon as possible after unconsciousness takes place. In many cases the manual method is much more efficacious than any mechanical device. See PULMOTOR.

AS'PIRATOR, an instrument used to promote the flow of a gas from one vessel to another by means of a liquid. The simplest form of aspirator is a cylindrical vessel containing water, with a pipe at the upper end which communicates with the vessel containing the gas, and a pipe at the lower end, which may be closed by a stop-cock. By allowing a portion of the water to run off by the pipe at the lower part of the aspirator, a measured quantity of air or other gas is sucked into the upper part. There are several variations of this principle.

AS'QUITH, HERBERT HENRY (1852–), Premier of England at the outbreak of the World War, a Liberal statesman identified with an epoch-making change in the British constitution—the removal of the veto power from the House of Lords. He was graduated at Balliol College, Oxford, and before he entered Parliament, in 1886, he engaged in law practice. Asquith's defense of John Burns for taking part in the Trafalgar Square riot, in 1887, brought him widespread notice, and he rose rapidly in public esteem, becoming Home Secretary under Gladstone in 1892. He was conspicuous as a Home Rule advocate at this time, and in 1905 was appointed Chancellor of the Exchequer in the Campbell-Bannerman Ministry.

Three years later Asquith became Prime Minister. During eight years of office he sponsored many reform measures, including the Lloyd George budget of 1909, the Parliament Act of 1911, whereby the House of Lords was deprived of the veto power, the Insurance Act and the Irish Home Rule Bill. Though Asquith aroused the antagonism of a good many elements, including the Unionists and the suffragists, he was remarkably successful in holding together the Liberal party. His tact and poise were admirable qualities for a peace Premier, but after the outbreak of the World War it was felt that he lacked the decision and energy needed to bring the war to a victorious conclusion. In 1916 a Cabinet crisis occurred and he was superseded as Premier by Lloyd George. Thereafter he was the spokesman for a considerable body in the House of Commons, and on more than one occasion he forced the government to ask for a vote of confidence. In the general Parliamentary election of December, 1918, Asquith was defeated by a coalition candidate.

Related Articles. Consult the following titles for additional information:
Burns, John — Home Rule
George, David Lloyd — Liberal
Great Britain — World War

ASS, a small animal related to the horse and the zebra. It has ears longer than those of the horse, but in shape resembling those of the zebra. The domestic ass is supposed to have sprung from a wild variety found

in Abyssinia. There are numerous varieties, varying in size and strength, but all are noted for their endurance and their ability to subsist on the coarsest food, even when found only in small quantities. In the East the ass has been prized for centuries as a beast of burden and for other domestic purposes. In the United States it is but little used except for breeding purposes, the offspring of an ass and a mare being the valued work animal called mule. The milk of asses is nutritious, and in some parts of Africa large herds are kept solely as milk animals. See HORSE; MULE.

ASSAM', an important province of British India, since 1912 under its present organization. From 1906 to 1912 it was joined with a part of Bengal under the name Eastern Bengal and Assam. The area of the present province is 61,471 square miles; its population in 1911 was 7,059,857, about 115 to the square mile. At the head of the government is a British commissioner.

Situated in the extreme northeast of the Indian peninsula, just south of the tall Himalayas, where the moisture from the mountains is precipitated, Assam has the heaviest rainfall of any part of the world. In many years the downpour reaches over 800 inches; in 1861, 905 inches fell. In July and August the heaviest rains occur. The heat is seldom excessive. The land is fertile, and tea is grown in an ever-increasing acreage; Europeans own most of the plantations. The people are nearly all Hindus.

ASSAS'SINS, an Asiatic order or society which in the twelfth century became powerful in Persia and Asia Minor and terrorized the country by the systematic murder of all who were opposed to the society. Upon a select band fell the work of assassination, to which they were stimulated by the intoxicating influences of hashish (see HASHISH). From the epithet *hashishim* (hempeaters), which was applied to the order, the European word *assassin* has been derived. Rulers often made use of the services of the assassins to rid themselves of enemies.

ASSAULT' AND BAT'TERY. An assault in law is an attempt to inflict bodily injury upon another; battery is the actual infliction of the injury, or the consummation of the assault. Though the offenses are distinct and separate, they are usually committed together and punished as one. Mere words of abuse or threat are not sufficient to constitute assault; there must be the appearance at least of actual intent and ability to do violence. The least touch of another's person, wilfully, negligently or in anger, may constitute battery. The use of corporal punishment by parents or teachers upon children, students or apprentices, is justifiable only to the extent that is necessary in the emergency, and any excess of violence constitutes assault and battery.

ASSAYING, *as sa'ing*, from Latin words which mean *to examine* or *drive out*, refers to the process by chemistry of determining the purity and value of ores, particularly gold and silver, or of the value of those metals which may be contained in coins or plate.

Miners who take ore from the mine carry samples to an assay office to have the quantity of metal determined; people who wish to sell gold or silver jewelry or plate may have the articles assayed to determine their value, based upon the market price per ounce. In England no article of jewelry is exposed for sale in the shops until it has been assayed and officially stamped. All governments which buy bullion from which to make gold and silver coins pay for it according to the value determined by assay.

Two processes are employed by chemists in assaying ore or bullion. These are called the *dry method*, or *cupellation*, conducted by fire processes, and the *wet method*, securing results by so-called gravimetric and volumetric analysis. These processes are too complicated to be explained to the non-technical reader.

Assay Offices. In the United States government assaying is in charge of the Mint Service of the Treasury Department. An assay office, as usually understood, is a place designated by the government where gold and silver are purchased, sold, assayed and refined. At these offices no coins are stamped; the process of coining is confined to the mints (see MINT).

The assay offices of the United States are located in the following cities:

New York, N. Y.	Helena, Mont.
Carson City, Nev.	Salt Lake City, Utah
Charlotte, N. C.	Deadwood, S. D.
St. Louis, Mo.	Seattle, Wash.
Denver, Colo.	New Orleans, La.
Boise, Idaho	

The mints are at Philadelphia, San Francisco and Denver. See COINING; METALLURGY.

ASSEMBLY, a term often applied to the legislative body of a state. Frequently it is used to designate the house of representatives, as distinguished from the senate. See LEGISLATURE.

ASSIGNMENT, in law, is the process by which a person relinquishes his claim to property of any kind and gives to another legal possession of it. Assignments, even though for small values, should always be in writing, although in some jurisdictions verbal transfers in the presence of witnesses are sufficient. Assignment of wages yet to be earned is frowned on in many states, as being contrary to the public welfare. Assignment of growing crops not yet ready for harvest is legal. Assignment for the benefit of creditors is usually in the name of a trustee acting for a court (see BANKRUPTCY).

ASSIMILA'TION, the appropriation of food for the growth, support and development of living tissues, takes place in the cells. In animals and man the blood in the capillaries brings to the cells the materials which they have the power of changing and so adapting to their own uses that they grow and become capable of performing new and even different functions. In order that assimilation shall take place rapidly in any organ, there must be a large supply of blood. This is the case in muscle and nerve tissue, while in bone, which changes more slowly, the blood vessels or capillaries are fewer. The blood itself must circulate with a normal degree of rapidity, be of sufficient amount and composed of proper materials. There must also be taken into the system a sufficient quantity of food that is of good quality and easily digested. See DIET; NUTRITION; SECRETION.

ASSINIBOI'A, a former district in Canada, forming one of the Northwest Territories. In 1905 nearly the whole district, which had an area of 90,000 square miles, was included in the new province of Saskatchewan. For description of the district, see SASKATCHEWAN.

ASSIN'IBOIN, (*stone boilers*), the name given to a Siouan Indian tribe because when first known to the whites they boiled water by dropping hot stones into it. They lived between the Missouri and Saskatchewan, on both sides of the Canadian border. About 1,250 are now on a reservation in Montana, and about the same number live in Canada.

ASSINIBOINE, a river of Canada, which flows through Manitoba and joins the Red River of the North at Winnipeg, after a somewhat circuitous course of about 450 miles from the west and northwest. It is navigable for over 300 miles.

ASSOCIATED PRESS. The reader of a daily newspaper sees at the head of many articles the caption "By the Associated Press." Such a heading means that the newspaper he is reading has a share in the privileges of a great news-gathering organization, composed of the publishers of nearly all the leading American newspapers. For convenience the United States is divided into four sections—eastern, western, central and southern—and each of these divisions has a central office and a superintendent. Reports are telegraphed to the central office, and from there to all members of the Association in the division. No European publishers are admitted to membership, and no American publisher not a member may make use of Associated Press dispatches. The association was organized in New York in 1849, and has become the largest organization of its kind in the world. Smaller American associations of a similar nature include the United Press and the International News Service.

ASSOCIATION FOOTBALL, a form of football which originated in England and has been growing in popularity in the United States during recent years. In England, where it is as popular as baseball is in America, the game is called "Soccer." It is played on a field which is marked off in accordance with the accompanying diagram, and resembles the American Rugby football game in general purposes, although the method of playing is vastly different. The field, which may vary in length from 100 to 130 yards, and in width from 50 to 100 yards, is rectangular in form, and has, in the middle of each end line, two goal posts 8 yards apart and joined by a bar 8 feet from the ground. The object of the game is for one of the eleven players of one side to kick the ball between the goal posts of the opposing side. The game is played in two halves of 45 minutes each, unless otherwise agreed upon, separated by an interval of five minutes. At the beginning of the second half the players change goals.

At the beginning of the game, the football, which is spherical in form, is placed on the ground in the center of the field and kicked

by a member of one team toward the opponent's goal. No one of the opponents is allowed to come within ten yards of the ball until it has been kicked off, nor is any player allowed to pass the center of the ground in the direction of his opponent's goal until the ball is kicked off. Thereafter, the players may take any position on the field they wish.

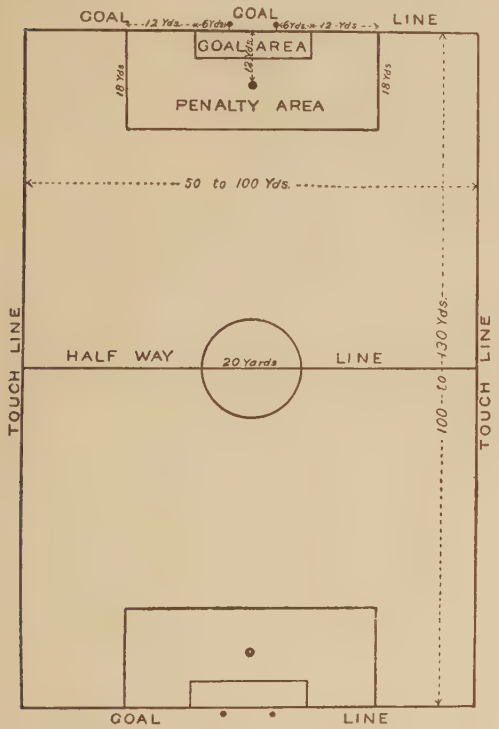


DIAGRAM OF THE FIELD IN ASSOCIATION FOOTBALL

When the ball goes out of bounds, it is thrown in from the point where it crossed the touch line by an opponent of the player who forced the ball out. The man throwing the ball in takes it in both hands and throws it from above his head as he stands at the line facing in. Whenever the ball is passed between the goal posts and under the bar without being thrown, knocked down or carried by a player of the opposing side, a goal is scored. If the ball strikes the goal posts or cross-bar and returns to the field, it continues in play as before. The team making the most goals in the specified time wins the game. This game may be played by more than eleven players on a side, and thus gives an opportunity to many more individuals than the American Rugby game. Moreover, it does not call for so great an amount of strength nor entail so many injuries. Though not as rough as the American game, it is equally exciting. See FOOTBALL.

ASSOCIATION OF IDEAS, the term used in psychology to include the conditions under which one idea is recalled to consciousness by the aid of another. Some psychologists classify these conditions under two general heads, those governed by the law of contiguity and those governed by the law of similarity. The first states the fact that actions, sensations, emotions and ideas which have occurred together or in close succession, tend to suggest one another when any one of them is afterward presented to the mind. The second indicates that present actions, sensations, emotions or ideas tend to recall their like from among previous experiences. Other laws have at times been given, but they are reducible to these. On their physical side the principles of association correspond to the physiological facts of re-excitation of the same nervous centers, and in this respect they have played an important part in the endeavor to place psychology upon a basis of positive science. See PSYCHOLOGY; HABIT; MEMORY.

ASSUAN, *a swahn'*, a town of Upper Egypt on the east bank of the Nile, below the first cataract. It has a garrison and is the depot for the caravan trade with Sudan. The granite quarries of the Pharaohs, from which were procured the stones for the great obelisks and colossal statues of ancient times, are in the neighborhood. The great Nile dam, built by the British government, adds much to the prosperity of Assuan (see IRRIGATION). This great structure, which was completed in 1902 and subsequently enlarged, is 144 feet high and over a mile in length. It is one of the world's most important engineering projects. Population in 1907, 16,128.

ASSUMP'SIT, an action in law to recover compensation or damages for the non-performance of an agreement. Assumpsits are of two kinds—*express*, where the case is based upon contracts actually expressed in writing, and *implied*, as in the employment of a person to do work. In the latter case the fact of a bargain for the performance of work implies the necessity for payment.

ASSUMPTION, *as sump'shun*, FEAST OF THE, a Christian festival in commemoration of the miracle through which Christ and the angels transported into heaven the soul and body of the Virgin Mary. It is observed on

August 15 by the Roman and Greek Catholic Churches, but it is not observed by any other religious bodies. Several painters have found inspiration for great canvases in the story of the Assumption, among them Titian, Rubens, Perugino and Murillo.

An Assyrian King

ASSYRIA, *a se'ri a*, an ancient country in the Tigris-Euphrates region, one of the oldest of the world's civilizations, for centuries proud and powerful, but reduced to ashes by its rivals. No trace of it remained, but in the nineteenth century its former glories began once more to be revealed through excavations (see EXCAVATIONS IN ANCIENT LANDS).

Assyria occupied the northern part of the plain of Mesopotamia, and was bounded on the north by the mountains of Armenia, on the east by Media, on the south by Susiana and Babylonia and on the west, probably, by the watershed of the Euphrates. It embraced an area of about 75,000 square miles. Several mountain chains crossed the plain, which was watered by the Tigris River and its tributaries. The more fertile portion was in the east.

People. The Assyrians resembled their Babylonian kinsmen in many respects, but were more rugged and warlike. They delighted in cruelty, and their kings were wont to boast of torturing their prisoners. Their religion was a worship of various gods representing the powers of nature. The great national deity was Asshur. Their language was almost a pure Semitic, and was expressed in writing by cuneiform symbols (see CUNEIFORM INSCRIPTIONS). They had a literature comprising hymns to the gods, mythological poems and works on astrology, law and chronology. They were ruled by a king, and their government was better organized than that of any other people of their day.

In architecture and sculpture they surpassed the Babylonians, though in the other arts and in the sciences they were inferior to them. Their buildings were of brick, but the foundations and walls were faced with stone slabs, on which were carved sculptures appropriate in subject for all the parts of the temples and palaces. Their palaces were quadrangular, with chambers grouped around three courts. The temples were pyramid-shaped. The Assyrian sculpture is remarkable for its colossal man-headed bulls and lions guarding the portals, and its decorative scenes in low-relief. The most of the reliefs are scenes of contemporary history, showing how the Assyrian soldiers marched, encamped, crossed rivers, attacked cities, cooked, tortured enemies and sacrificed to the gods. There are also some scenes of daily court life, showing the king banqueting with his queen and hunting lions with courtiers. The Assyrian sculptors knew nothing of perspective, but excelled in chiseling single figures in relief. The industrial arts were highly developed. The king and his courtiers dressed in richly embroidered and figured stuffs; their arms and armor were highly finished; the king's throne was of carved ivory and wrought gold, and he was served from superbly decorated gold, silver and bronze vessels.

History. In the ancient Greek legends, the building of Nineveh and the founding of the kingdom of Assyria are ascribed to a mythical hero, Ninus, and his queen, Semiramis (see SEMIRAMIS). But in the cuneiform inscriptions, which have recently been deciphered and are now generally considered better authority on the subject than the classical authors, the name of Ninus is not recorded, and that of Semiramis appears first in the ninth century B. C. The first settlers probably came from Babylonia not later than 1900 B. C., as the rulers, with their capital at Asshur, began to make their presence felt in Mesopotamia about 1800 B. C. They were constantly fighting for extension of territory, and toward the end of the eleventh century B. C., under the leadership of Tiglathpileser I, they gained in a large measure control over Babylonia. With this

THE GOD NERGAL

ruler began that devotion to the arts for which Assyrian monarchs were famous. After two centuries which were comparatively uneventful, there arose a strong ruler named Asurnazirpal, who waged vigorous wars on all sides and made Assyria a great empire. Nineveh, which in the eleventh century had been made the capital, rose to the position of mistress of the Eastern world. The successors of Asurnazirpal pushed their armies in a westerly direction, making conquests in Syria and Phoenicia.

Sargon II was the founder of the last and most glorious dynasty of Assyria (721–606 B. C.). He completely subjugated Babylonia, overcame the Hittites, put an end to the Kingdom of Israel and made Judah and the Mediterranean cities pay tribute. His successors, Sennacherib, Esarhaddon and Asurbanipal (Sardanapalus), were kept busy maintaining the supremacy of the Assyrian power over the broad realm. Under Asurbanipal, Assyria rose to the height of its greatness; from the frontiers of India to the Aegean Sea its rule was supreme. But as the treasures of the world poured into the capital, the people became fond of ease and luxury and would not go to war to protect their foreign possessions. Province after province revolted, but Asurbanipal was a powerful monarch and managed to keep his kingdom intact. After his death, however, the decline of Assyrian power was rapid. Finally, in 606 B. C., the Babylonians under Nabopolassar, the Chaldean, with the aid of the Medes, overthrew Nineveh. Assyria was then divided between the Medes and Babylonians. See BABYLONIA; NINEVEH; also ARCHITECTURE.

AS'TER, a genus of plants of the family Compositae (which see), including several hundred species, mostly natives of North America, although species are widely distributed in other regions. Many are cultivated as ornamental plants. Their name, from the Greek word for *star*, refers to the starlike flowers. Asters generally flower late in the season, and in England they are known as the Michaelmas daisy. The China aster is a very showy annual, of which there are many varieties in cultivation, some with large, brilliantly colored heads that rival the chrysanthemums.

AS'TEROIDS, or **PLANETOIDS**, a group of very small planets revolving round the sun between the orbits of Mars and Jupiter, remarkable for the eccentricity of their orbits and the large size of their angle of inclination to the ecliptic. The diameter of the largest is not supposed to exceed 450 miles, while most of the others are very much smaller, one at least being only twelve miles in diameter. They number over 270, and new members are being constantly discovered. Ceres, the first of them, was discovered January 1, 1801, and within three years Pallas, Juno and Vesta were seen. The extraordinary smallness of these bodies and their nearness to one another gave rise to the opinion that they were but the fragments of a planet that had formerly existed and had been brought to an end by some catastrophe.

For nearly forty years investigations were carried on, but no more planets were discovered till December 8, 1845, when a fifth planetoid, Astraea, was discovered in the same region. The rapid succession of discoveries that followed was for a time taken as a corroboration of the disruptive theory; but the breadth of the zone occupied makes the hypothesis of a shattered planet more than doubtful, and now each planetoid is supposed to have had an independent origin. Eros approaches the earth more nearly than any other body excepting the moon. The mean distances of the asteroids from the sun vary between 200,000,000 and 300,000,000 miles; the periods of revolution, between 1,191 days (Flora) and 2,868 (Hilda). Their total mass does not exceed one-fourth that of the earth.

ASTHMA, *as'mah* or *az'mah*, a disorder of the breathing apparatus, the symptoms of which are difficulty in breathing, returning at intervals; a feeling of weight across the chest and in the lungs; a wheezing, hard cough at first, which becomes more free toward the close of each paroxysm. Asthma is essentially a spasm of the muscular tissue which is contained in the smaller bronchial tubes. It attacks men more often than women, is often a disease of children and seems, in some instances, to be hereditary. The exciting causes are various—accumulation of blood or viscid mucus in the lungs, exposure to noxious vapors, to a cold and foggy atmosphere or to close, hot air. It frequently follows such diseases as measles and bronchitis. By far the most important part of the treatment consists in removing the exciting causes. It seldom proves fatal except as it induces dropsy, consumption or other disease.

ASTIG'MATISM, a malformation of the lens or cornea of the eye, in consequence of which the individual does not see objects in the same plane, although they may really be so. The trouble is due to the fact that parallel rays of light are bent unequally in different planes because the curvature of the cornea or lens is not normal. If a person suffering from astigmatism looks at black lines radiating from a center, some of them appear much brighter than others. This is a reliable test. Astigmatism is a very common ailment, and is responsible for a number of disorders, such as eye strain, headache, nervous indigestion, etc. Any noticeable eye defect should have the attention of an oculist. Properly fitted glasses will remedy the trouble.

AS'TOR, the name of a family of wealthy business men, prominently identified with New York real estate.

John Jacob Astor (1763–1848), founder of the American line of Astors, emigrated to New York from Germany in 1783. He made a fortune in fur trading, and was one of the pioneers of the West, founding, in 1811, Astoria, Ore., near the mouth of the Columbia River. This settlement became a central depot for the fur trade between the Great Lakes and the Pacific. He subsequently engaged in various speculations, and died worth probably $30,000,000, leaving $400,000 to found the Astor Library in New York. His descendants are the principal ground landlords of the city of New York.

JOHN JACOB ASTOR

William Backhouse Astor (1792–1875), son of John Jacob Astor, carried on the enormous business interests of his father and is said to have left $50,000,000. He added $200,000 to his father's bequest for a public library, besides many valuable books and documents.

William Waldorf Astor (1848–1919), grandson of William B. Astor, was elected to the state assembly of New York in 1877, and to the state senate in 1879. From 1882–1885 he was minister plenipotentiary to Italy. He inherited the greater part of the enormous Astor estate in 1890, but ten years later he took up his residence in England, becoming a British subject. On January 1, 1916, he was created Baron Astor of Hever Castle.

John Jacob Astor (1864–1912), son of William Astor (1830–1892) and grandson of William B. Astor, was notable for undertaking many different lines of activity. He was graduated from Harvard in 1888, traveled extensively, invented several mechanical devices, including a marine turbine engine, and saw active service in the Spanish-American War. Some of New York City's finest hotels, including the Waldorf–Astoria and the Knickerbocker, were part of his magnificent estate. He died through the sinking of the *Titanic*, in April, 1912, being one of those who gave up a place to the women when the life boats were launched. His young wife, Madeline Force Astor, was among the rescued, and later in the year she gave birth to a son who received the name of the founder of the line.

[William] **Vincent Astor** (1891–), son of the late John Jacob Astor and his first wife, and chief heir to the Astor estate, carries on in a vigorous manner the business activities of his father. He became prominent also in the National Civic Federation and in various philanthropic enterprises. During the World War, after the United States entered the conflict, he served in guarding New York's important bridges and buildings from possible enemy attacks.

ASTO'RIA, Ore., the county seat of Clatsop County, seventy miles north of Portland, on the Spokane, Portland & Seattle Railroad, and on the Columbia River, nine miles from its mouth. It was the fifth city in size in the state in 1917. The construction of a jetty has made its harbor one of the largest on the coast. There is a large export trade of lumber, wheat, flour and other products. Salmon fishing and canning are the most important industries, and there are several lumber mills, box factories, iron works and other establishments. The city has a public library, a hospital and Astor Park. There is also an old fort, established in 1805 by Lewis and Clark (see Lewis and Clark Expedition). Many beach and river resorts are near the city. Astoria was the first settlement in the Columbia Valley, founded as a fur trading station by John Jacob Astor in 1811. It was

chartered as a city in 1876. Population, 1910, 9,599; in 1917, 10,487 (Federal estimate).

ASTRAG'ALUS, the upper bone of the foot, which supports the weight of the body in standing and takes part in most movements of the foot. It is a strong, irregular-shaped bone, is connected with the others by powerful ligaments and, with the leg bones, forms the hinge joint of the ankle.

ASTRAKHAN, *ahs tra kahn'*, a name given to a fine fur of a variety of sheep found in Bokhara, Persia and Syria, and deriving its name from Astrakhan, a city in European Russia. The fur, which is woolly and glossy and tightly curled, is used in making muffs, collars and other winter garments. The name is also applied to a coarse cloth which is an imitation of this.

ASTRAKHAN, a Russian city, capital of the government of the same name, situated on a high island in the Volga, sixty miles from the Caspian Sea. Before the revolution of 1917 the city had a population of 162,000 and was a flourishing center for the export of caviare, isinglass, leather, and astrakhan, carrying on a thriving trade with all the Caspian ports.

ASTRINGENT, *as trin'jent*, a medicine which contracts the organic tissues and canals of the body, thereby checking or diminishing excessive discharges. Physicians recognize two kinds of astringents—vegetable and mineral. The former contain tannic and gallic acids; the latter include alum, lime-water, nitrate of silver, nitric and hydrochloric acids, etc. Astringents are used in the treatment of diarrhoea, hemorrhage, and discharges from mucous membranes.

ASTROL'OGY, literally, the science or doctrine of the stars. It was the precursor of astronomy, just as alchemy was of chemistry. The name was formerly used as equivalent to astronomy, but is now restricted in meaning to the practice of judging of the effects and influences of the heavenly bodies on human affairs and to the foretelling of future events by the stars. As usually practiced, the whole heavens, visible and invisible, were divided by great circles into twelve equal parts, called *houses*. As the circles were supposed to remain immovable, every heavenly body passed through each of the twelve houses every twenty-four hours. The position of any planet was settled by its distance from the boundary circle of the house, measured on the ecliptic. The houses had different names and different powers, the first being called the house of life, the second the house of riches, the third of brethren, the sixth of marriage, the eighth of death, and so on.

The part of the heavens about to rise was called the *ascendant*, the planet within the house of the ascendant being *lord of the ascendant*. To *cast a person's nativity* (or *draw his horoscope*) was to find the position of the houses at the instant of his birth. The position of the planets being determined, the astrologer, who knew the various powers and influences possessed by the sun, the moon and the planets, could predict what the course and termination of that person's life would be. The temperament of the individual was ascribed to the planet under which he was born, that is, to the planet which was lord of the ascendant at that time. If Saturn was ascendant, the person was saturnine in temperament; if Jupiter, he was jovial; if Mercury, mercurial. The virtues of herbs, gems and medicines were supposed to be due to their ruling planets. See ASTRONOMY.

ASTRON'OMY is that science which investigates the motions, distances, magnitudes and various phenomena of the heavenly bodies. That part of the science which gives a description of the motions, figures, periods of revolution and other phenomena of the heavenly bodies is called *descriptive astronomy*, that part which teaches how to observe the motions, figures, periodical revolutions and distances of the heavenly bodies, and how to use the necessary instruments, is called *practical astronomy;* and that part which explains the causes of their motions and demonstrates the laws by which those causes operate, is termed *physical astronomy*.

The Earliest Science. Almost as far back as the beginning of civilization we find the beginnings of astronomy—the earliest science. And the fact that it was the earliest seems natural enough when we consider the question seriously. People might drink water for centuries without wondering in the least about

its chemical properties; they might know, that a heavy object dropped from the hand would invariably fall *down,* without once wondering why it did not fall *up;* they might quarry rock from the earth without ever a question as to how it got to its present position. All of those things were so close at hand as to seem almost commonplace; people knew how to make use of such material objects and of the obvious facts about them, and that was enough to satisfy any unscientific age.

Ancient Belief. But the sun, the moon, the stars—they presented different questions. The question was not what to do with them; the problem was, what are they? Too conspicuous to be overlooked, too far away to be examined, it was natural that about them should grow up theories and religions, and finally a science. But at first the science was not just what we call astronomy; it was that, and something else. The wise men who far back in Chaldea stayed on their roofs through the night to study the heavens were not interested simply in the positions, the movements, the relative brightness of the heavenly bodies; those things chained their attention, but chiefly as an aid to something else. Could it be that the stars, the constellations, the comets, had nothing to do with human life? Those old investigators could not believe that such a thing could be. To them, the earth was, of course, the central fact in the universe, even before the theory was advanced that it was the central body; and what reason was there for the existence of those innumerable points of light, shifting, changing, if they did not in some way influence the earth and its inhabitants? And so there grew up what we call now *astrology,* a regular science of predicting events, and especially the fortunes of men, from the positions of the heavenly bodies. The Egyptians, the Chaldeans, the Hindus, the Chinese, placed great faith in the so-called science; the Jews, after the captivity, practiced it; the Greeks and Romans made much use of it. Even the early Christians believed in it thoroughly, and it was not until the time of Copernicus, in the sixteenth century, that the science of astronomy really began to emerge and to stand as a science worth while in itself, not merely as an aid to astrology. Copernicus, by his discovery of the fact that the sun was the center of the universe and that our earth is but one of the bodies that revolves about it, overthrew the theory that the heavenly bodies were but fortune-tellers for men.

A Most Wonderful Science. As it is the oldest, so astronomy is one of the most wonderful, of the sciences—the most wonderful, perhaps. For with other sciences the materials are at hand; wonderful as was the discovery that water is composed of two gases; wonderful as have been the discoveries about the geologic ages which have preceded us, yet the water was there to be analyzed, the rocks and fossils could be touched, measured, examined. But the nearest of the heavenly bodies is so far away that our minds can have no conception of the distance, and yet astronomers have determined accurately not only those distances, but the size of the various planets, their weight, and even their composition. The methods by which these wonderful discoveries have been made are too technical to be studied here, but a single example of what has been accomplished may serve to convince us as to the almost miraculous character of these discoveries.

The Attraction of the Planets. From the time of the great discovery of Sir Isaac Newton in 1686, the discovery of the law of gravitation, astronomers found the things which they could figure out were almost infinitely increased. The sun held the earth in its elliptical path by a certain pull, just as it held every other planet; but that was not all. The earth pulled the sun and every other planet, and every other planet pulled the earth. Of course, since the other planets are so much smaller than the sun their pulls are very much less, but still they are enough to demand consideration (see GRAVITATION). The path of any planet about the sun is not just what it would be if it were the only planet; all the other planets are drawing it a little from its course, this way or that way.

The Appearance of the Planets. Of course to us the most interesting phase of astronomy is simply the appearance of the heavens, not through a telescope but to the naked eye. The planets in their seasons, the bright stars, the groups of stars called constellations, cannot fail to draw and hold our attention whenever we are out on a clear night. Perhaps the most interesting, though by no means the most conspicuous, objects in the heavens at night are the planets. Of these there are eight, counting the earth. Mercury, the planet that is nearest the sun, is almost never seen without a telescope. It

ASTRONOMY

Definition: Astronomy is the science which treats of the heavenly bodies.

SOLAR SYSTEM

Sun

1. 865,000 miles in diameter.
2. In volume 1,300,000 times the size of the earth.
3. Distance from the earth about 93,000,000 miles.
4. Sun-spots vary in size from 1,000 to 100,000 miles in diameter.
5. Its gravity 27 times that of the earth.
6. Probably composed of heated gases held together by gravity.

Mercury

1. Nearest the sun.
2. Diameter about 3,000 miles.
3. Moves round the sun in 88 of our days.
4. Greatest distance from the sun 43,000,000 miles.
5. Its volume $\frac{1}{17}$ that of the earth.

Venus

1. Second from the sun.
2. The most brilliant planetary body.
3. 2,300,000 miles from the earth.
4. Diameter about 7,700 miles.
5. Will cross sun's disk June 8, 2004.

Earth

1. Third from the sun.
2. Fifth in size.
3. Has one moon.
4. Greatest distance from sun 92,963,000 miles.
5. Velocity in its orbit 17 miles a second.
6. Thickness of atmosphere, 50 to 60 miles.

Mars

1. Fourth from the sun.
2. Greatest distance from the sun 152,000,000 miles.
3. Distance from the earth varies from 35,000,000 to 244,000,000 miles.
4. Requires two years to revolve about the sun.

Jupiter

1. Fifth from the sun
2. Three times as large as all the other planets put together, but $\frac{1}{1000}$ part as large as sun.
3. Mean diameter 85,000 miles.
4. Mean distance from sun 475,000,000 miles.
5. Accompanied by seven moons

Saturn

1. Sixth from the sun.
2. Diameter about 70,000 miles.
3. Mean distance from the sun, 875,000,000 miles, and a revolution requires 29½ years.
4. Has eight satellites and a system of flat rings.

Uranus

1. Seventh from the sun.
2. Mean distance from sun 1,750,000,000 miles.
3. A year equal to 84 of our years.
4. Its mean diameter about 33,000 miles.

Neptune

1. Eighth from the sun.
2. Mean distance from sun 2,600,000,000 miles.
3. About 35,000 miles in diameter.
4. Invisible to the naked eye.
5. Has one moon.

General Divisions: Descriptive Astronomy. Practical Astronomy. Physical Astronomy.

STELLAR SYSTEM

Stars

Characteristics

1. Always occupy the same relative position.
2. Called "fixed stars," but many actually move.
3. Classified according to brightness.
4. Telescopic stars, those unseen by the naked eye.
5. Vary in color, as red, yellow, blue and green.

Number

1. As seen by the telescope the number is incalculable
2. But a few thousand visible to the naked eye.

Size

1. Little is known as to absolute size.
2. The light of Sirius, the brightest fixed star, is estimated as 63½ times that of the sun.
3. Astronomers recognize stars as small as those of the sixteenth magnitude.

Distance

The shortest distance from the earth that of Centauri, 20,000,000,000 miles.

Zodiac — Constellations

1. The region containing the paths of the sun, moon and planets
2. Was marked out into 12 parts, each with its constellations, denoted by certain signs.
3. The twelve signs of the zodiac. Aries, the Ram, Taurus, the Bull; Gemini, the Twins; Cancer, the Crab; Leo, the Lion; Virgo, the Virgin, Libra, the Balance; Scorpio, the Scorpion; Sagittarius, the Archer; Capricornus, the Goat; Aquarius, the Waterman; Pisces, the Fishes.

Milky Way

1. Encompasses the heavenly sphere like a girdle
2. The luminous appearance caused by a multitude of stars visible only to the strongest telescope.
3. At one part it divides into two branches separated for a distance of 150° and then reunites.

Orion. The most brilliant constellation in the northern sky.

Nebula

1. A white cloud-like patch of light always in the same position.
2. Two nebulae visible to the naked eye, the one in Orion. About 10,000 seen through the telescope.
3. It is probable that nebulae include clouds of meteors

is said that the great astronomer Copernicus grieved because he would die without having seen it. Sometimes about three-quarters of an hour after sunset it may be seen for about fifteen minutes.

The old Greeks talked much about Hesperus, and our own poets love to write of the Lucifer, the morning star, but we know that it is the same planet Venus which a little earlier appeared in the evenings.

We have doubtless all noticed a certain star which shines with a steady brightness, and which is the reddest star in the sky. This is the planet Mars. The brightest of the planets

THE WINTER HEAVENS
(From the Scientific American)

evening star. This brilliant star which, in certain seasons, appears in the southwest shortly after sunset, is the planet Venus. Gradually, night by night, it rises higher. At length it appears to remain stationary for a few evenings, then it returns and finally disappears. Soon after its disappearance there is seen in the southeast, a little before sunrise, a bright star. The Greeks called this next to Venus is Jupiter, which appears sometimes at such an hour that it is called the evening star. Saturn is a bright star with a slightly reddish tint, Uranus is rarely seen without a telescope, and Neptune only with a telescope.

Far more conspicuous than the planets and far more easy to study are the "fixed stars," as they are called. This term does not mean

that such stars are always in the same place; that you will always find the star Sirius, for example, in the same place at the same hour. But it means that such stars keep the same positions relative to other stars—that they do not move about as do the wandering planets.

been called, the world over, the Great Bear. Just why, we do not know. We can find no resemblance to a bear, but we do find a very clear resemblance to a dipper in the seven stars. In January, at the time when we are supposed to be looking at the sky, the dipper is standing almost straight upright on its

THE SUMMER HEAVENS
(From the Scientific American)

The Winter Heavens. Let us suppose that we are looking at the heavens on a clear evening in January, at about eight o'clock. We will turn first to the north where is the constellation which all people in North America know best—the Great Dipper. The seven stars which form this well-known group, together with many other fainter stars about them, have for centuries and centuries handle. At the bend of the handle is the star called Mizar; near it is a small star which the Arabs called sometimes the Lost One, sometimes the Proof. These names were given it because it is so hard to see—the latter one because the ability to see it was considered proof of keen sight.

The two stars that form the upper edge of the dipper, that farthest from the handle,

are called *pointers,* because a line drawn through them and continued passes almost through Polaris, the North Star. This star, with six others, some fairly bright, some quite faint, makes the Little Dipper, not nearly so perfect as the big one, but quite recognizable.

Now imagine a line drawn through Mizar, the star which we have just learned is at the bend of the handle of the Great Dipper, and the North Star. About as far on one side of the North Star as Mizar is on the other are five rather bright stars which are so placed as to form an irregular letter M. These five, with one fainter star, form what is known as Cassiopeia's Chair.

These are the most notable groups of stars in the northern sky. Now let us turn to the south. The most beautiful constellation in our sky is now before us. This is Orion, the Warrior, of whose deeds before he was set in the sky as a constellation the ancients told many wonderful tales. The easiest stars in the figure to find are the three bright bluish ones, set in an oblique line, which form the belt. Below the belt, at a right angle with the lowest of the three stars, is a small star, which is in the sword. The bright reddish star above marks one shoulder of the hero, the other shoulder being formed by a somewhat fainter star; while below the girdle Rigel, one of the brightest stars we see, shows the right foot, and a smaller star, east of Rigel, marks the left knee, on which Orion rests while he fights the bull. The bull is the constellation Taurus, an irregular group of stars north and west of Orion.

The brightest star in this group is the reddish star called Aldebaran, seen almost directly in the south at the time we are making our observations; and to the north and west of Aldebaran is the beautiful cluster of the Pleiades. Six stars may be counted in this little group on a clear night, and they are arranged somewhat in the form of a dipper. The Pleiades is one of the most celebrated of the constellations. Some ancient nations began their year with its rising, and the Book of Job speaks of it (XXXVIII: 31): "Canst thou bind the sweet influences of the Pleiades, or loose the bands of Orion?"

Now let us come back to Orion. If we follow the line of the three belt stars downward, we come to the most magnificent star in the heavens—Sirius, the Dog Star. This beautiful star is estimated to be about thirteen times as large as our sun.

North of the red star Aldebaran, and almost directly overhead, is a very bright star, Capella. Of course there are other bright stars and other interesting constellations, but these are the easiest to locate and the ones most often referred to.

The Summer Heavens. If, now, we imagine that the time has changed, and we are looking at a July sky, we shall find that that has changed, too. The Great Dipper is still visible in the north, near the horizon, but now it seems to rest on the front edge of the bowl. The Little Dipper and Cassiopeia are in the same relative positions, but in different places in the sky. If we, in our imagination, trace a line through the last two stars of the handle of the Great Dipper, we shall find a bright, golden star, called Arcturus. In the east appears a bluish star, brighter than Arcturus, called Vega. West and south of Vega is the beautiful Northern Crown, a semicircle of six stars, with its bright central star called the Gem.

But the brightest constellation of the July sky is the Scorpion, directly in the south. Its brightest star, Antares, with three fainter stars, forms a figure like a boy's kite, while a line of stars below Antares forms the tail. This is a very easily recognizable constellation, and when you have once found it you will look for it in the summer sky, as you do for Orion in the winter.

Early History. The most remote period to which we can go back in tracing the history of astronomy, the oldest of the sciences, refers us to a time about 2500 B. C., when the Chinese are said to have recorded the simultaneous conjunction of Saturn, Jupiter, Mars and Mercury with the moon. This remarkable phenomenon is found, by calculating backward, to have taken place 2460 B.C. Astronomy has also an undoubtedly high antiquity in India. The mean annual motion of Jupiter and Saturn was observed as early as 3062 B. C.; tables of the sun, moon and planets were formed, and eclipses calculated. In the time of Alexander the Great, the Chaldeans or Babylonians had carried on astronomical observations for 1900 years. They regarded comets as bodies traveling in extended orbits and predicted their return; and there is reason to believe that they were acquainted with the true organization of the universe.

The priests of Egypt gave astronomy a religious character; but their knowledge of

the science is testified to only by their ancient zodiacs and the position of their pyramids with relation to the cardinal points. It was among the Greeks that astronomy took a more scientific form. Thales of Miletus, who was born 639 B. C., predicted a solar eclipse, and his successors held opinions which are in many respects wonderfully in accordance with modern ideas. Pythagoras (500 B. C.) promulgated the theory that the sun is the center of the planetary system. Great progress was made in astronomy under the Ptolemies, and we find Timochares and Aristyllus employed about 300 B. C. in making useful planetary observations. But Pristarchus of Samos, who was born 267 B. C., is said, on the authority of Archimedes, to have far surpassed them, by teaching the double motion of the earth around its axis and around the sun. A hundred years later Hipparchus made important discoveries and even undertook a catalogue of the stars.

It was in the second century after Christ that Claudius Ptolemy, a famous mathematician of Pelusium in Egypt, propounded the system that bears his name; viz., that the earth was the center of the universe, and that the sun, moon and planets revolved around it in the following order: nearest to the earth was the sphere of the moon; then followed the spheres of Mercury, Venus, the Sun, Mars, Jupiter and Saturn; then came the sphere of the fixed stars; these were succeeded by two *crystalline* spheres and an outer sphere, which last was again circumscribed by the *coelum empyreum*, of a cubic shape, wherein happy souls found their abode.

The Arabs began to make scientific astronomical observations about the middle of the eighth century, and for 400 years they prosecuted the science with assiduity. Ibn-Yunis (A. D. 1000) made important observations of the disturbances and eccentricities of Jupiter and Saturn. In the sixteenth century Nicholas Copernicus, born in 1473, introduced the system which bears his name, and which gives to the sun the central place in the solar system and shows all the other bodies revolving around it. This arrangement of the universe came at length to be generally received, on account of the simplicity it substituted for the complexities and contradictions of the theory of Ptolemy.

The observations and calculations of Tycho Brahe, a Danish astronomer, born in 1546, continued over many years, were of the highest value, and won for him the title of regenerator of practical astronomy. His assistant and pupil, Kepler, born in 1571, was enabled, principally by the aid he received from his master's labors, to arrive at those laws which have made his name famous: 1, That the planets move, not in circular, but in elliptical orbits, of which the sun occupies the position of a focus; 2, that the radius vector, or imaginary straight line joining the sun and any planet, moves over equal spaces in equal times; 3, that the squares of the times of the revolutions of the planets are as the cubes of their mean distances from the sun.

Modern Knowledge. Galileo, who died in 1642, advanced the science by his observations and by the new revelations he made through his telescopes, which established the truth of the Copernican theory. Newton born in 1642, carried physical astronomy suddenly to comparative perfection. Accepting Kepler's laws as a statement of the facts of planetary motion, he deduced from them his theory of gravitation. The science was enriched toward the close of the eighteenth century by the discovery by Herschel of the planet Uranus and its satellites, the resolution of the Milky Way into myriads of stars, and the unraveling of the mystery of nebulae and of double and triple stars. The splendid analytical researches of Lalande, Lagrange, Delambre and Laplace mark the same period.

The nineteenth century opened with the discovery of the first four minor planets, and of the existence of another planet (Neptune) more distant from the sun than Uranus. Of late years the sun has attracted a number of observers, the spectroscope and photography having been especially fruitful in this field of investigation. From recent transit observations the former calculated distance of the sun has been corrected, and is now given as 92,560,000 miles. Much valuable work has of late been accomplished in ascertaining the parallax of fixed stars.

There is no subject that makes a stronger appeal to the imagination than astronomy. "The heavens declare the glory of God" is as true to-day as when it was written, centuries ago. Contemplation of the sun, moon and stars awakens in the mind questions that take one far away from the commonplace aspects

Wonder Questions on Astronomy

How big is the universe?

The universe is boundless. To describe its size is as impossible as to tell the duration of eternity. Neptune, the outermost planet in the solar system, is nearly two billion eight hundred million miles from the sun; the immensity of our own portion of the universe is therefore beyond the grasp of human comprehension. But we know that the stars are themselves suns and centers of other solar systems, and that there are thousands and thousands of stars. The star nearest our sun, Alpha Centauri, is about twenty-five billions of miles away. Who can even try to estimate the distance of those stars that seem to us to be far out on the borders of space?

What keeps the sky in place?

The beautiful blue dome that we call the sky seems to us to be a tangible thing, but it is only empty space. Therefore it does not have to be kept in place, and it could never fall to the earth. The blue that we see is caused by reflection of the sun's rays. White sunlight is composed of the seven colors of the rainbow. The air contains floating specks of dust and other tiny particles of matter, and these bodies absorb a portion of the light rays and reflect the others. Those that are reflected make the color combination that gives the sky its blue appearance. But if we could sail in a balloon to the upper atmosphere, which is practically clear, we would drift about in darkness and empty space.

Do stars really fall?

Everyone has seen at some time or another what appears to be a star shooting out of its place in the sky. But there are no such things as falling stars. What you see is a small body from the depths of space, which on reaching our atmosphere becomes intensely heated by friction with the air. Such a body is called a meteor. Meteors travel at an incredible rate of speed, and when they touch the air surrounding the earth their temperature is raised about 600,000 degrees. Most of them burn up in the air, but sometimes portions of them actually fall to the earth.

Where do the stars go in the morning?

The stars are suns, like our own, and they shine by their own light. We can see them only at night, however, because during the day the sun's rays are so bright they shut out the light from other heavenly bodies. But the stars remain in their places day and night, and when they fade out in the morning it is only because their light cannot pierce through the brilliance of the sun's rays. If you should go down into a deep well in the daytime and look up into the sky you could see stars because you would be out of the range of the sunlight.

Who is "the Man in the Moon"?

That curious resemblance to a man's face that we see in certain markings on the moon used to puzzle the ancients greatly. We know now that the markings are moon mountains and huge craters of extinct volcanoes. Of course the resemblance to a face is only apparent when the moon is seen with the naked eye. If we looked at it through a powerful telescope we would have to use a great deal of imagination to find any Moon Man there.

Why doesn't the moon appear round all of the time?

To understand this we must remember that the moon is a dark body, like the earth, and that it is only visible to us when it reflects the light of the sun. The moon makes a complete revolution around the earth in a little less than a month. Now, when it is directly between us and the sun the side turned toward us receives no light at all, and so we have moonless nights. As it moves along its orbit a thin crescent is illuminated. This grows larger each night until we have a half-moon, or first quarter. Finally, the moon gets in such a position that the side turned toward us is wholly illuminated, and we have the round, full moon.

What strange thing may happen when the moon is between the earth and the sun?

Sometimes the moon comes between the earth and the sun in such a way that it shuts off the light of the sun. Then we have the phenomenon of the solar eclipse. When the eclipse is total the light of day fades into the darkness of night, the stars shine out, and though it may be morning the birds tuck their heads under their wings and the chickens go to roost. An average eclipse lasts about three minutes. Astronomers predict that one of seven minutes duration will take place on June 20, 1955. It will be noticeable near Manila, in the Philippine Islands.

What keeps the earth and other planets from flying off into space?

Every particle of matter in the universe exerts an attractive force on every other particle; that is, seems to try to pull every

other bit of matter toward it. This pulling force is called gravity, or gravitation. The earth and all the other planets follow their regular orbits around the sun century after century because they are held in place by gravitation, and every motion in the entire solar system is accounted for by this marvelous force. We know how gravitation acts, but we do not know just what it is. Like electricity, it is one of nature's mysteries, but its effects can be accurately computed.

How many different motions has the earth?

The earth is moving in three different ways. It is rotating on its axis once in about twenty-four hours, a motion that gives us day and night. At the same time it is traveling in its orbit around the sun, making a complete revolution in one year. This is the motion that gives us our seasons. But the entire solar system is traveling through space at a terrific rate of speed, and the earth, as a part of the system, is therefore engaged in a third movement. This onward movement is carrying us toward the star Vega at the rate of about 36,000 miles an hour.

What causes the spots on the sun?

The sun is surrounded by a fiery, gaseous envelope called the photosphere. This envelope is subject to terrible storms, the violence of which is beyond human power to imagine. At times these storms tear great rents in the photosphere, just as a strong wind severs a mass of clouds. Through these holes the eye looks into the sun itself, and the exposed places appear like black spots. As a matter of fact, the spots are exceedingly bright; they seem dark only because their brightness is contrasted with the much greater splendor of the photosphere. The spots are usually circular, but some of them are twisted into extraordinary shapes. They vary greatly in size. Astronomers observed one in 1905 that was estimated to be large enough to completely cover forty planets, each the size of the earth. Spots of this size can readily be seen without the aid of a telescope if the observer uses a smoked glass.

How do planets differ from stars?

In regard to appearance, stars seem to us to twinkle, while planets shine with a steady light. That is because the planets are so much nearer to us than the stars: the latter are all far beyond the limits of our solar system. Through the telescope a planet appears as a globe, but a star as a mere point of light. Though stars are glowing suns shining by their own light, and planets are dark worlds shining by the reflected light of the sun, stars do not look so bright as planets because of the immense distances between them and us. Indeed, it seems wonderful that we should be able to see them at all.

What planet is encircled by millions of moons?

Saturn is the planet which bears this distinction. Multitudes of small satellites, each traveling in its own orbit, are journeying about this wonderful planet, and they form a system known as the "rings of Saturn." There are two bright rings, called the Outer and the Inner, and between the Inner ring and the globe itself there is a faint one that is called the crape ring, because through the telescope it looks as if made of that cloth. The satellites that form the rings are so small that they cannot be distinguished from one another, even when viewed through the most powerful telescopes. An interesting fact about the bright rings is that they have dark rifts in them. These are the places where moons are lacking, just as if someone had taken an immense broom and swept a few millions of them away. Besides its rings, Saturn has ten other satellites similar to our own moon.

Are the other planets inhabited?

This is a subject that is of absorbing interest, but astronomers can only conjecture the answer to the question. Venus is much nearer the sun than is our earth, but it is surrounded by a thick envelope of clouds, which would modify the intense heat and light received by the planet. It is possible that life does exist there. There is considerable evidence, on the other hand, for the belief in an inhabited Mars. This planet has seasons much like our own, except that they are twice as long. Night and day on Mars are only a little longer than those on earth. There are white patches at the poles of the planet, which increase and decrease in size according to season, and most astronomers believe these to be areas of ice and snow, such as occur in the polar regions of earth. The peculiarity that has awakened the most speculation, however, is the presence on our neighbor planet of a network of lines, running with perfect regularity for hundreds of miles. An American professor has worked out a theory that these are artificial waterways constructed by a race of beings of extraordinary intelligence. All we can say with any certainty is that Mars is in a situation as favorable for habitation as our own planet, and there is reason to suppose people do live there. As for the other planets, they differ in so many particulars from our earth that discussion of their habitancy becomes pure speculation.

Outline on Astronomy

I. Definition
II. General divisions
  (1) Descriptive astronomy
    (a) Description of the
      (1) Motions
      (2) Figures
      (3) Periods of revolution
      (4) Other phenomena of the heavenly bodies
  (2) Practical astronomy
    (a) Teaches how to observe the
      (1) Motions
      (2) Figures
      (3) Periods of revolution
      (4) Distance of heavenly bodies
    (b) Teaches how to use instruments
  (3) Physical astronomy
    (a) Explains cause of motions
    (b) Demonstrates laws by which causes operate
III. History
  (1) Among the Egyptians
  (2) Among the Chaldeans
  (3) Among the Chinese
  (4) Among the Greeks
  (5) Among modern peoples
  (6) Unsolved problems
IV. The solar system
  (1) The sun
    (a) Size
    (b) Distance
    (c) Physical nature
      (1) Sun spots
      (2) Rotation
      (3) Corona
    (d) Eclipses
    (e) Physical and chemical effects
      (1) Light
      (2) Heat
      (3) Gravitation
    (f) Solar photography
  (2) The earth
    (a) Form and rotation
    (b) Time; longitude
    (c) Atmosphere
    (d) Gravitation
    (e) Satellite—the moon
      (1) Size
      (2) Character of surface
      (3) Distance
      (4) Orbit
      (5) Relation to tides
  (3) Other planets—shape, size, rotation, constitution, appearance
    (a) Mercury
    (b) Venus
    (c) Mars
    (d) Jupiter
    (e) Saturn
    (f) Uranus
    (g) Neptune
    (h) Minor planets
  (4) Nebular Hypothesis
  (5) Planetesimal Hypothesis
V. The stellar system
  (1) Stars
    (a) Characteristics
    (b) Number
    (c) Size
    (d) Distance
  (2) Constellations
    (a) Cassiopeia
    (b) The Great Bear
    (c) Orion
    (d) The Pleiades
  (3) Comets
    (a) Composition
    (b) Motions
VI. Laws of motions of heavenly bodies
VII. Methods of determination of
  (1) Distances of planets
    (a) From the sun
    (b) From the earth
  (2) Size of heavenly bodies
  (3) Mass of heavenly bodies
VIII. Astronomical instruments
  (1) Telescope
  (2) Measuring instruments
  (3) Transit instrument
  (4) Mural circle
  (5) Altitude and azimuth instrument
  (6) Equatorial
IX. Great astronomers

of everyday life. Because such queries are a stimulus to the imagination and open up to young people new avenues of knowledge, we herewith include two pages of "wonder questions" and their answers. This material deals with some of the elementary facts of astronomy, but the information should suggest to the reader the possibilities of further study.

Related Articles. Consult the following titles for additional information:

STARS, CONSTELLATIONS AND PLANETS

Algol	Earth	Pleiades
Aquarius	Gemini	Pole Star
Arcturus	Jupiter	Saturn
Aries	Leo	Sirius
Bear, Great	Libra	Southern Cross
Cancer	Mars	Sun
Canis, Major	Mercury	Taurus
Capricornus	Neptune	Uranus
Cassiopeia	North Star	Venus
Centaurus	Orion	

INSTRUMENTS

Chronometer	Telescope
Sextant	Theodolite
Spectroscope	Transit Instrument

ASTRONOMERS

Brahe, Tycho	Herschel, Sir William
Burnham, S. W.	Holden, Edward S.
Copernicus	Kepler, Johann
Flammarion, C.	Laplace, Pierre S.
Galileo	Newcomb, Simon
Hall, Asaph	Proctor, Richard A.
Halley, Edmund	Ptolemy
Herschel, Sir John F. W.	Young, Charles A.

GENERAL TOPICS

Apsides	Nebula
Ascension, Right of	Nebular Hypothesis
Asteroids	Node
Astro-Photography	Nutation
Aurora Borealis	Observatory
Calendar	Parhelion
Comet	Planet
Conjunction	Precession of the Equinoxes
Constellations	Satellite
Declination	Solar System
Double Stars	Solstice
Eclipse	Star
Ecliptic	Transit
Fixed Stars	Yerkes Observatory
Halo	Universe
Horoscope	Zenith
Lick Observatory	Zodiac
Meteor	Zodiacal Light
Milky Way	
Moon	

ASTRO-PHOTOG'RAPHY, the use of the photographic camera in the study of the heavens. In 1840 John W. Draper as American chemist, obtained a photograph showing the formations on the surface of the moon. This was probably the first really successful photograph of any part of the sky; but since that time photography has come to be one of the most important aids the modern astronomer has. The sensitive plate and the lens make no errors in recording their observations, and by various processes these observations are made intelligible and can be studied at leisure without the interruptions that occur when the heavenly bodies are being studied through the telescope.

ASUNCION, *a soon'the on*, the capital of Paraguay, situated on the Paraguay River, about 970 miles north of Buenos Aires. The most important buildings are the cathedral, several other churches and convents and the government buildings, including the president's palace, houses of congress, arsenal and custom house. The city also has a college and a hospital. The principal trade is in tobacco, fruits, Paraguay tea, hides, provisions and manufactured goods. It is a good river port, and numerous steamers and sailing vessels are found in its harbor. It was founded in 1536 on the Feast of the Assumption; hence its name. Population, 1912, estimated, 84,000.

ATAHUALPA, *ah ta wahl'pa*, the last of the Incas, succeeded his father in 1529 on the throne of Quito, while this brother Huascar obtained the kingdom of Peru. They soon made war against each other; the latter was defeated and his kingdom fell into the hands of Atahualpa, who took terrible vengeance on his opponents. At this juncture the Spaniards under Pizarro appeared and by a trick seized Atahualpa, who offered a vast ransom in gold. Huascar offered a greater sum, and Atahualpa in retaliation caused his brother to be killed. Pizarro secured the ransom and then, after accusing Atahualpa of treason, had him quickly tried and executed. See INCA; PIZARRO, FRANCISCO.

ATALAN'TA, in Greek mythology, a famous huntress of Boeotia. Her story is told in these volumes in the article MYTHOLOGY.

ATCHAFALAYA, *ach a fa li'ah* (Lost Water), a river of the United States, an outlet of the Red River. It branches off before the junction of the Red River with the Mississippi, flows southward, and enters the Gulf of Mexico by Atchafalaya Bay. Its length is 220 miles, the greater part of which is navigable for river vessels.

ATCHISON, *atch'e s'n*, KAN., an important railway center and the county seat of Atchison County, settled in 1854 and named in honor of a United States Senator. The city is on the Missouri River, forty-nine miles northwest of Kansas City, and has the service of the Atchison, Topeka & Santa Fe, the Missouri Pacific, the Chicago, Rock Island & Pacific and the Chicago, Burlington & Quincy railroads. There are railroad car shops, foundries, breakfast food mills,

grain elevators, furniture factories and many minor industries. It is the seat of Midland College (Lutheran), Saint Benedict's College and Mount Saint Scholastica's Academy (Roman Catholic), and there is a state soldiers' orphans' home. Population, 1910, 16,429; in 1917, 16,785 (Federal estimate).

ATHABAS'KA, a former district of Canada, belonging to what was known as the Northwest Territories. It covered an area of 251,300 square miles, and was included between the parallels 55°N. and 60°N., and the meridians 100°W. and 120°W. Athabaska was divided in 1905, the western part becoming the northern half of Alberta and the central part the northern half of Saskatchewan. A narrow strip on the eastern border, at that time added to Keewatin, was joined to Manitoba in 1912.

ATHABASKA LAKE, a large lake in Canada, situated in the northern part of the provinces of Alberta and Saskatchewan. It is about 200 miles long and thirty-five miles wide at its broadest part. Its waters are carried to Great Slave Lake through Great Slave River. The northern shore is high and timbered with fir, spruce and poplar. The southern shore is low and level.

ATHABASKA RIVER, a river of Canada which rises in Alberta on the eastern slope of the Rocky Mountains and follows an easterly and northerly course to Athabaska Lake. It then flows out of the western end of the lake and unites with the Peace River to form the Slave. From its source to the lake the river is 750 miles long; its junction with the Peace occurs fifteen miles north of the lake.

ATHAPAS'CAN INDIANS, a great family of North American Indians who lived in the vast region which extended from Alaska through British North America to the northern boundary of the United States, and in isolated groups south as far as Mexico. A single tribe living near Lake Athabasca bore this name. The Chinook, Apache and Navajo are Athapascan. The language of these scattered tribes was practically the same. With the exception of the Navajo and Apache, they were not warlike. Those of the north lived by hunting and fishing, while the tribes of the Pacific coast lived in permanent villages. The Athapascans of Alaska, Canada and the United States number at present about 50,000.

A'THEISM, the doctrine that denies the existence of God. Atheism is contrary to the instincts of man, yet doubtless there have been individuals who sincerely believed that no God is possible. Agnosticism, which is sometimes confounded with atheism, is the belief that the existence of God cannot be proved.

ATH'ELSTAN (895–940), the first monarch who was known officially as king of England, succeeded his father, Edward the Elder, in 925. He was victorious in his wars with the Danes of Northumberland and with the Scots, and after his great victory at Brunanburh he governed in peace. Athelstan was a grandson of Alfred the Great.

ATHENAE'UM, the temple of Athene (or Minerva) at Athens, where poets and men of letters met and read their productions. The same name was given at Rome to the school which Hadrian established on the Capitoline Mount for the promotion of literary and scientific studies, and provided with a regular staff of professors. Similar institutions were established at Lyons, Marseilles and other places. In modern times the same name is given to literary clubs and establishments connected with the sciences.

ATHE'NE. See MINERVA.

Athena

ATHENS, *ath'enz,* a name that is associated with the finest achievements in art, philosophy and literature that the world has ever known. Athens, "the eye of Greece," was in ancient times the capital of Attica and the nucleus of an empire, and it was also the center of a culture so lofty in ideal and attainment that it is still the wonder of mankind. To-day the city is the capital of the modern kingdom of Greece, and its history is merged with that of the whole country. In the period of its glory the people of Athens were first of all Athenians, and secondly Greeks.

Modern Athens. The city is situated on a plain between mountainous country and the sea, about 350 feet above sea level. Its ancient harbor, Piraeus, is about five miles distant, on the Gulf of Aegina. The modern city extends in the form of a crescent about the so-called "Old City," which lies

THE PARTHENON, AT ATHENS

THESEUM, AT ATHENS

at the base of the Acropolis. The new city is regularly laid out and has straight, broad streets and many handsome edifices. A central square, the Square of Harmony, forms a point from which several modern boulevards radiate. Among the important buildings are the House of Parliament, the National Archaeological Museum, the National University and the marble Stadium. Among the educational institutions is the American School of Classical Studies, which is maintained by the universities of the United States. Industrially the city is of only secondary importance, producing chiefly rugs, silks, scarfs and metal ware. Population, 1917, about 175,000.

Ancient Athens. When one speaks of ancient Athens, one means Athens in the time of Pericles, rather than Athens throughout the period of its long growth or the subsequent period of decay. According to tradition Athena and Neptune entered into a contest to determine which should name the city; Athena won, and it was called Athens, in her honor. In the Age of Pericles, Athens was a strong walled city, built about the Acropolis, which was a rocky elevation about 300 feet above the level of the city, having on its summit a comparatively level area of somewhat less than ten acres. It was accessible only on the west, where a stairway of sixty marble steps led to a series of colonnades and porticoes called the Propylaea, or Gateway. This was a magnificent structure built of white Pentelic marble and trimmed with black marble. Just within the entrance was the colossal statue of Athena, the patron and defender of the city. On the right, and a little to the rear, was the Temple of the Wingless Victory (Nike Apteros), and to the right of the open space rose the Parthenon, an exquisitely beautiful temple dedicated in 438 B. C. It was entirely of fine Pentelic marble and was the sacred abode of the goddess Athena, in whose honor it was erected (see PARTHENON).

To the left of the entrance stood the Erechtheum, a beautiful temple of which there still remains the famous Porch of the Maidens (see CARYATIDES). The city surrounded the Acropolis on every side, extending to a distance of about a mile therefrom. To the north and directly in front of the Acropolis was the Tower of the Winds, a beautiful structure erected in 159 B. C. and still well preserved. To the west were the Hill of the Nymphs and the Areopagus (Mars Hill), the rocky eminence from which Paul is supposed to have preached to the Athenians. To the northwest lay the Theseum, a beautiful temple which is still in a fine state of preservation. On the southwest slope of the Acropolis was the ancient Theater of Dionysus, and beyond it the stately Olympieum, begun about 535 B. C., but not finished until seven hundred years later. Under the Romans, Athens was a flourishing city which in the second century Hadrian ornamented with many new buildings; but after that time much of the beauty of the city was destroyed, the Parthenon was lost to pagan religion and became a church of the Virgin Mary. In 1456 Athens fell into the hands of the Turks, and the Parthenon became a mosque. During the siege of Athens by the Venetians in 1687 this beautiful building was greatly damaged by an explosion, but enough of it was left to attest its original splendor.

History. According to tradition, the founder and first king of Athens was Cecrops. Theseus, who united under his leadership the twelve independent townships of Attica, was the most famous of the early Athenian kings and the favorite national hero. The last king was Codrus, whom it was felt there was no one worthy to succeed, and the state was accordingly organized as an oligarchy, with an executive officer known as the *archon*. The number of archons was later increased to nine. The aristocratic form of government grew to be very unsatisfactory to the people, because the rulers, bound by no written laws, could practice any oppressions they chose, and the lower classes finally revolted and demanded written laws. Draco, one of the archons, drew up a code of laws (see DRACO), but the people saw that these old laws were thoroughly inadequate and demanded new ones, which were accordingly formulated by Solon (see SOLON). In 561 B. C., Pisistratus, by the aid of a dissatisfied class in the state, made himself tyrant of Athens, and the city prospered under his rule and that of his sons, Hippias and Hipparchus, who succeeded him.

In 509 B. C. a new constitution, proposed by Clisthenes, was adopted, and under it a democratic government was set up. This new constitution introduced little that was new into the government of Athens, but provided for the new conditions which had grown up

since the constitution of Solon was formed. Athens was divided into one hundred divisions called *demes;* each citizen was enrolled in one of these divisions and took his surname from the deme, instead of from his clan. Ten of the demes, not adjacent, but scattered as widely as possible so as to include the various local interests, composed a *ward,* and thus the political unity of the old

1, Propylaea; 2, Parthenon; 3, Erechtheum; 4, Olympieum; 5, Areopagus; 6, Theseum; 7, Odeum; 8, Temple of Dionysus; 9, Tower of the Winds; 10, Stadium.

clans was destroyed. Many of the aliens throughout Attica were under this new constitution enrolled as citizens.

The aid which Athens sent to the Ionian colonies in Asia Minor in 499 brought on the Persian wars (see GREECE, subhead *History*), and at the close of this struggle Athens found herself the leader of Greece. The Confederacy of Delos, organized in 476 for the purpose of freeing Greek colonies from Asiatic control, became in time a consolidated empire with Athens as its capital. The fifty years which followed were the most brilliant in Athenian history; especially under Pericles was Athens the literary and artistic center of the world (see PERICLES).

In 431 Sparta, jealous of the position of influence which Athens held as head of the Delian League, demanded that Athens free all of the Greek cities. Athens in reply demanded that Sparta let go her own conquests in the Peloponnesus, and the result was the Peloponnesian War (see GREECE, subhead *History*). At the close of this conflict, Athens was deprived of much of her power, and her democratic government was replaced by an oligarchy under the Thirty Tyrants (see THIRTY TYRANTS). Although even under the reëstablished democracy Athens never regained her former political position, she remained the intellectual center of Greece. After Philip of Macedon had conquered Greece (338 B. C.), Athens was still the center of Hellenic culture, until rivaled by Alexandria in the second century B. C. Under Roman rule, the city was greatly favored by some of the emperors, especially Hadrian, who built up a new quarter in the northwest of the city. From the time of Justinian, who closed the schools of philosophy at Athens, until the eleventh century, the history of Athens is almost a blank.

During the twelfth, thirteenth and fourteenth centuries the city was sometimes independent and at other times subject to some Italian city or to Turkey. Turkish rule was firmly established late in the seventeenth century and continued until after the Greek revolution in 1835, when Athens became the capital of the new kingdom of Greece. The restoration of the ancient Stadium in 1902 and the inauguration of the revived Olympian games (which see) are interesting events of recent history. The connection of Athens with the World War is told in the articles on Greece and on the war.

ATHENS, GA., founded in 1800 as the seat of the state university and yet possessing that school, is the county seat of Clarke County, seventy-three miles northeast of Atlanta. It is on the Oconee River, which is not navigable, and on the Georgia, the Central of Georgia, the Southern, the Seaboard Air Line and the Gainesville Midland railroads. The city has eight cotton mills, a cotton oil refinery, three fertilizer plants and two oil mills. In addition to the university, the state normal school, the state college of agriculture, the Lucy Cobb Institute and other private schools have given Athens its popular name, THE CLASSIC CITY. There is a Carnegie Library. Population, 1910, 14,913; in 1917, 18,319 (Federal estimate).

ATH'ERTON, GERTRUDE FRANKLIN (1857–), an American novelist who has gained a vast number of readers among those who enjoy forceful and realistic stories of modern life. Mrs. Atherton is an enthusiastic champion of social justice, woman suffrage and other democratic movements, and many of her ideas have found their way into her books. Her novels include *Senator North,* a story of society and politics in Washington, D. C., *The Conqueror,* an ex-

ceptional based on the life of Alexander Hamilton; *The Californians, Ancestors, Patience Sparhawk, Tower of Ivory, Julia France and her Times* and *Perch of the Devil.* In 1918 was published her stirring novel based on the idea of a revolution of German women, entitled *The White Morning,* and in 1919, *The Avalanche.* The author was born in San Francisco and was educated in California and Kentucky. She is a great-grandniece of Benjamin Franklin.

ATHLETICS, *ath let'iks,* from Greek words which mean *to contend for a prize,* is a term incorrectly applied to every form of exercise. It is actually restricted to those sports of the track and field which take the form of personal contests. Running, hurdling, putting the shot, discus throwing, hammer throwing, the pole vault and the like were the earliest forms of athletics; now baseball, football, lacrosse, basketball, rowing, lawn tennis, hockey, polo, etc., are usually included in the term. Such exercises as weight lifting, club swinging and feats on the horizontal bar are included in gymnastics (which see).

Distinctions among Athletes. The standing before the public of those who enter athletic contests is sharply drawn. A contestant is either a *professional* or an *amateur.* That which marks one as an amateur is that he does not play for hire; once he has done so he is stamped as a professional, and thereafter he loses his amateur standing, and cannot thenceforth contest with amateurs. In all schools and colleges, where the athletic spirit is encouraged, the sports should be purely amateur. Efforts are always made to keep them so. An amateur in this sense is "any person who has never competed in an open competition or for public money, or for admission money, or with professionals for a prize, public money or admission money; nor has ever at any period of his life taught or assisted in the pursuit of athletic exercise as a means of livelihood; nor is a mechanic, artisan or laborer."

Work and Play. Observing people know that one can work hard if he can play hard. There may be temporary profit but not permanent gain from much work and no play; there is sure to be failure—financial, and often moral—from a life of much play and too little work. Shakespeare told us that "No profit grows where is no pleasure taken;" the human machine cannot long stand a strain from which there is not temporary relief. Another truthfully said that "All work and no play makes Jack a dull boy;" no variety enters into his life and he fails to acquire the stimulus and exhilaration which always come with change.

Granted, then, that games and play are as necessary as work, what shall we play, and when? We are told, with characteristic force and pleasing brevity, when not to play, by Theodore Roosevelt, who says, "When you play, play hard, but when you work do not play at all." Americans play more than other peoples; we are the most prosperous nation on earth, also, and many people believe that there is relation between these facts. Healthful recreation is more and more taking the place of sports and games which not only are no benefit to health, but which are positively injurious. Anything which compels one to be out of doors, which makes him breathe deeply and use all his muscles in well-balanced and not over violent exercise, is to be encouraged.

Brief statements respecting some of our deservedly popular games may well be given here. No man or woman need be ashamed to admit a liking for healthful sports or hesitate to participate in them. There are more outdoor contests for men than for women, but in at least two, lawn tennis and golf, women are worthy rivals of men in efficiency displayed and in their understanding of the fine points of the games. Baseball is enjoyed by women as keenly as by most men, even though they cannot play the game.

Athletic Sports. The usual sports of an athletic meet may be classified as those of the track and those of the field, the former being held in a circular track, or cinder path, enclosing the inner field where the latter sports are held. The *track events* consist of races, which are the sprints of 50 yards, 100 yards, 440 yards and the long-distance runs of one-half mile, 1 mile and 2 miles, and the hurdle races. The *field events* are the high jumps and the broad jumps, the pole vault, the shot put, the hammer throw and the discus throw.

The *hurdle races* are usually two in num-

ber: one for 120 yards, over 10 hurdles, each 3 feet, 6 inches high; and the other of 220 yards, over 10 hurdles, each 2 feet, 6 inches high. In the race over high hurdles, the first is 15 yards from the starting line; each hurdle is 10 yards from its neighbor, and the tenth is 15 yards from the finishing line. In the low hurdle race, the hurdles are distributed at intervals of 20 yards throughout the course. A hurdle race requires great skill and endurance, as well as high speed. While the hurdler may run the first stretch and the last stretch as he pleases, he must, if he is to succeed at all, take always exactly the same number of steps between hurdles and jump over them in precisely the same way each time. The record for the low hurdles is about 23⅗ seconds; for the high hurdles, about 15½ seconds.

In making a *pole vault* the athlete takes the pole, which is usually at least 16 feet long, and, measuring the height of the bar with his eye, takes hold of the pole at the proper height and goes back for his run. With the long pole extending forward, he runs down to the "take-off" and puts the iron-shod end of the pole into the ground and leaps upward, throwing his feet above his head and pushing his body up at arm's length till he is above the cross-bar. Then, with a quick motion, he throws the pole from him and himself over the bar. In each competition three trials are allowed at every height at which the bar is placed. The amateur record for pole vault is somewhere near 11 feet, 11 inches.

The *shot put* consists in throwing or putting a 16-pound shot forward from the shoulder. It is not a throw exactly, but a push forward and upward. The competitor, who stands within a circle 7 feet in diameter, must not step outside in the course of his throw. The measurement is made from the circumference of the circle to the spot where the shot first broke ground. A 12-pound shot is the customary size in high school contests. The record for the 16-pound shot is about 49½ feet; the high school record for the 12-pound shot is about 44½ feet.

Hammer throwing is made under conditions similar to those of the shot put. The hammer, with its handle, must not exceed 4 feet in length, nor its total weight exceed 16 pounds. The head of the hammer is usually a spherical shot, and the handle, a chain with a wooden or metal attachment for the hands. The contestant, standing within his 7-foot circle, swings the hammer around his head to gain momentum and then throws it with the force of his body. The record for the 16-pound hammer is about 172 feet.

The *discus throw* is made from a 7-foot ring and is measured in the same way that the shot put and hammer throw are measured. The discus itself is of smooth, hard wood, weighted with lead in the center and capped with brass disks and a steel ring, and should not exceed 8 inches in diameter nor 2 inches in thickness at the center. Its weight is 4½ pounds. The discus is taken in the fingers of the right hand with the flat side lying against the palm of the hand and wrist, and with a whirling motion and a long, full-arm swing the discus is thrown. The record for the discus throw is about 140 feet.

Training. Each particular form of athletic exercise requires special training, if a person is to excel in it. Not only must the athlete do over and over again the things he expects to excel in, but he must learn the best ways of doing everything and must train himself to do them with the least possible expenditure of energy. It is here that the coach is best able to help the aspiring athlete. There are, however, some things which must be learned and done, no matter what the sport or game the person is to enter:

The *clothing* should be adapted to athletic contests; it usually consists of a shirt and knee pants of light cloth, thick stockings and shoes suitable for running on the road. A sweater or blanket is a necessity for use after exercise, in order to prevent taking cold. The rubber-soled gymnasium shoes are good for road work, though a light leather shoe is preferred.

The *exercise* should be general and not confined to the forms of exertion that are necessary in the particular contest. Anything that develops general strength and agility is an aid in any special contest. It is a serious mistake to try frequently to make a record for one's self; that is, to run at full speed over the entire course in which the competition is to take place, to throw the hammer as far as possible or to jump as high as one can. After two or three weeks of general exercise and trials of the event at a moderate pace, the person may safely, as often as once or twice a week, do his best without fear of injury. Some good athletes never attempt to make a record except in competition.

Proper *diet* is essential to any person's physical well-being. It is not necessary that a person should deny himself the things he likes to any great extent, or punish himself with a rigidly selected diet, but he should have good, wholesome, well-cooked food and plenty of it. Rich pastries and heavy, indigestible foods of all sorts should be excluded. He should be regular in his habits, and he should remember that tobacco and liquors and everything that overstimulates bring a reaction that is injurious.

Bathing is another important factor in athletic training. Every time after a person has been heated in exercise, he should take a shower bath or a sponge bath, and then rub himself thoroughly dry with a coarse towel. If a shower bath is used, a person should be careful not to turn on too cold water or to stay under the shower too long. On the other hand, if the water is too warm, it is debilitating in its effect. A cold sponge bath in the morning is always invigorating and never weakening.

Sleep is another of the important things connected with training. At least eight hours a night of good sound sleep are essential, and it is infinitely better if this sleep can be taken at regular hours. To retire early and have several hours of sound sleep before midnight is much better than to prolong rest the following morning.

Classified List of Games. In these volumes are presented almost 100 articles relating to athletic sports, games and plays, and to terms belonging to them. The portion of these which relate directly to outdoor recreation are classified below, so the person who seeks information on them may turn at once to the various titles in regular alphabetical arrangement:

Angling	Golf	Rowing
Archery	Hand Ball	Shooting
Baseball	Hockey	Skating
Canoeing	Hunting	Swimming
Coasting	Ice Yachting	Tobogganing
Cricket	Lacrosse	Trapping
Croquet	Lawn Tennis	Trawling
Curling	Marbles	Water Polo
Falconry	Polo	Wrestling
Fives	Quoits	Yachting
Football	Rounders	

ATH'OS, Mount (called by modern Greeks, Holy Mountain), a mountain of Turkey, 6,350 feet high, terminating the most eastern of the three peninsulas which project into the Aegean Sea. In a broader sense the whole peninsula is called Athos. The Persian fleet under Mardonius was wrecked here in 493 B. C., and to avoid a similar calamity during his invasion, Xerxes caused a canal, of which traces may yet be seen, to be cut through the isthmus that joins the peninsula to the mainland. On the peninsula there are situated about twenty monasteries and a multitude of hermitages, which contain about 6,000 inmates, half of whom are monks of the Order of Saint Basil. The others are lay brethren. It is said that women are not allowed on the Holy Mount. Athos was the center of Greek learning and theology, and the libraries of the monasteries are rich in literary treasures and manuscripts. The revenue of the community is derived from pilgrims and from a considerable trade in amulets, rosaries, crucifixes, images and wooden furniture.

AT'KINSON, Edward (1827–1905), an American economist and statistician. He invented the "Aladdin oven," an improved cooking stove, and wrote extensively on economic subjects, including banking, railroads, the tariff, finance and foods. He opposed the policy of adding to the national domain at the close of the Spanish-American War. Atkinson's writings include *The Science of Nutrition* and *Facts and Figures, the Basis of Economic Science.*

ATLAN'TA, Ga., thirty-second in size among American cities, popularly known as The Gate City of the South, has been the capital of the state since 1878 and is the county seat of Fulton County. It is northwest of the center of the state. New York City is 847 miles northeast, Chicago is 733 miles northwest, and New Orleans is 496 miles southeast. The city has eight railroads, including the Central of Georgia, the Georgia, the Southern, the Seaboard Air Line and Louisville & Nashville; they extend from Atlanta towards fifteen points of the compass. There is no navigable water; Chattahooche River is six miles northwest. Grant, Lakewood and Piedmont are the principal parks; these, with smaller ones, cover 850 acres. The population in 1910 was 154,839; in 1917, 196,144 (Federal estimate).

A Business Center. Atlanta is the seat of the Federal Reserve Bank of the Sixth Federal Reserve District. It has seven large banks which are members of the local clearing house and many smaller banking houses. There are over a dozen buildings eight or more stories in height, three of them being seventeen stories. The Federal building in Atlanta cost over $1,000,000. The state capitol cost fully as much.

The most important manufactures include cotton goods, cottonseed products, fertilizers,

furniture, shoes, steel products and flour. One of the city's most famous industries is the manufacture of the "soft drink" called coca-cola. South of the city is Fort McPherson, an army post, adopted in 1917 as a cantonment for the training of the national army.

Education. Atlanta is an educational center for both white and colored students. Here is located the Georgia School of Technology, a branch of the state university at Athens; Clark University (Methodist); Atlanta University (colored); Atlanta Baptist College (colored); Southern Dental College; a medical college, and many other schools. Six of the schools are for negroes, seven for whites. There is a large Carnegie Library, one city hospital and ten private sanitoriums.

History. The first house was built on the site of Atlanta in 1836. The town was incorporated in 1843, under the name of Marthasville, and the present name was adopted two years later. The city was chartered in 1847, and at the outbreak of the Civil War had a population of about 11,000. During the war it was an important military point, and in 1864 was captured by the Federal army under Sherman. The city was nearly destroyed by fire on its evacuation by the Union forces, but after the war it was quickly rebuilt. In 1877 it was made the capital of the state, in 1887 the International Cotton Exposition was held here, and in 1895 it was the scene of the Cotton States Atlanta Exposition. In May, 1917, occurred a very disastrous fire which burned about seventy-five city blocks, but which did not reach the finer residence districts.

ATLANTIC CITY, N. J., founded in 1854, is the most popular seaside resort in the United States, located fifty-eight miles southeast of Philadelphia and 150 miles south of New York City. It has 1,200 hotels, which accommodate 150,000 visitors at Easter time and as many as 350,000 during the summer season. It is no uncommon sight to view from the famous boardwalk, eight miles in length, 75,000 bathers in the sea at one time. The city is built on a long, narrow island known as Absecon Beach, and has the service of the Pennsylvania, the Reading and the West Jersey & Seashore railroads. One of the great hotels cost $4,000,000; another $2,000,000. The city has a Carnegie Library and two hospitals. There are no industries of importance. Since 1912 the town has been governed on the commission plan. Permanent population, 1910, 46,150; in 1917, 59,515 (Federal estimate).

ATLANTIC OCEAN, that division of the ocean lying between Europe and Africa on the east and north, and America on the west. Mount Atlas, in the northwestern part of Africa, has given its name in a modified form to this great expanse of water. Columbus was the first European positively known to have sailed directly across it, and since his time it has been traversed by craft of every kind, from the sailing ship to the giant passenger steamer and mighty warship.

The northern and southern boundaries of the Atlantic are not definitely fixed, but are generally considered to extend from the Arctic to the Antarctic Circle. This gives the Atlantic a length of 9,000 miles. Its width varies from about 700 miles, between Greenland and Norway, to 4,100 miles, between Florida and the Strait of Gibraltar. Between Cape Palmas in Africa and Cape Saint Roque in South America the distance is 1,900 miles, and it is about 3,200 miles from New York to Liverpool. The area, exclusive of branches, is about 30,000,000 square miles, an area almost twice that of the largest land division, Asia.

Important branches of the Atlantic are, on the east, the North Sea, the Baltic Sea, Bay of Biscay, Mediterranean and Gulf of Guinea, and on the west, Gulf of Mexico, Gulf of Saint Lawrence and Hudson Bay. Many geographers consider the Arctic Ocean merely as an extension of the Atlantic, while others consider it as a separate ocean. The coast line of the North Atlantic is irregular, but that of the South Atlantic is more even. The length of the eastern coast is over 32,000 miles; that of the western coast, 55,000 miles. Along the east coast the principal islands are the Faroes, the British Isles, the Canaries, the Madeiras and Saint Helena; those off the coast of America are Greenland, Newfoundland, the West Indies and the Falklands, while the Azores are just a little east and Iceland is just a little west of mid-ocean in the North Atlantic.

The bed of the Atlantic is divided, by a ridge extending north and south nearly midway between the continents, into two valleys, each of which is about 500 miles wide. The eastern varies in depth from 14,000 to 15,000 feet, and the western from 13,000 to 16,800.

The dividing ridge is comparatively narrow and has a depth of from 9,000 to 10,000 feet. North of the Azores the bed of the ocean gradually rises, forming a plateau whose length extends east and west from the Hebrides to Newfoundland. This is sometimes known as the telegraph plateau, because the Atlantic Cable is laid upon it (see CABLE, ATLANTIC). This plateau separates the cold waters of the Arctic Ocean from the warmer waters of the Atlantic. The greatest depths of the North Atlantic have been found east of Newfoundland, where soundings have been obtained as low as 20,000 feet, and north of Porto Rico, where a depth of 27,000 feet has been reached. The South Atlantic has depths varying from 20,000 to 24,000 feet.

Related Articles. Consult the following titles for additional information:

Gulf Stream	Tides
Ocean Currents	Waves

ATLAN'TIS, an island which, according to Plato, existed in the Atlantic near the Pillars of Hercules (Straits of Gibraltar), was the home of a great nation and was finally swallowed up by the sea. The legend has been accepted by some as fundamentally true, but others have regarded it as the outgrowth of some early discovery of the New World.

AT'LAS, in Greek mythology, a Titan whom Jupiter condemned to bear the vault of heaven. At his request Perseus showed him the head of Medusa, which had the property of turning all who looked at it to stone, and Atlas was changed into the mountains which bear his name. The name atlas is given to a collection of maps and charts, because in the first of these which were published the figure of Atlas bearing the globe appeared on the title-page.

ATLAS MOUNTAINS, an extensive mountain system in North Africa, starting near Cape Nun on the Atlantic Ocean, traversing Morocco, Algiers and Tunis, and terminating on the coast of the Mediterranean. They are divided generally into two parallel ranges, running west to east, the Greater Atlas lying toward the Sahara, and the Lesser Atlas toward the Mediterranean. The principal chain is about 1,500 miles long and contains two peaks over 14,000 feet high—Jebel Ayashi and Tamjurt. Its average height is over 11,000 feet. Silver, antimony, lead, copper and iron are among the minerals. The vegetation is European in character, except on low ground and near the desert.

ATMOSPHERE, *at'mos feer.* Surrounding the earth on all sides to a height of an unknown number of miles is the gaseous envelope we call the air or atmosphere. This envelope is a mixture of several gases, about seventy-nine parts being nitrogen and nearly twenty-one parts being oxygen. It is the oxygen that makes possible the existence of life on the globe, for it is the vital principle in the process of breathing. Besides nitrogen and oxygen the air contains small portions of water vapor, carbonic acid gas, ammonia, ozone, argon, helium and other gases, and minute particles of animal, vegetable and mineral matter.

Though it is invisible, air has weight, and it can be weighed, compressed, expanded, liquified or frozen into solid form. Over three centuries ago Galileo showed that air has weight, and a pupil of his, Torricelli, proved that the pressure of the atmosphere over a square inch of surface is the same as that of a column of mercury about thirty inches in height (see BAROMETER). At the surface of the earth the pressure is about fifteen (14.7) pounds to the square inch, but the pressure varies from hour to hour, and diminishes with the increase in altitude. About thirty-three miles above sea level the air has become so light that the particles of which it is made no longer touch each other.

The pressure upon the human body of average size is no less than fourteen tons, but as it is exerted equally in all directions, and the gases in the body exert an equal pressure in an opposite direction, no inconvenience is caused by it. It is customary to take the atmospheric pressure as the standard for measuring other fluid pressures; thus, the steam pressure of thirty pounds per square inch on a boiler is spoken of as a pressure of two atmospheres.

The importance of the fact that the air is a buoyant, expansible substance is demonstrated in numerous practical ways. The vacuum cleaner, the air brake, the flying machine, the air pump, the air rifle, pneumatic tools and many other devices are based on the various properties and laws of air. In physiology, we learn that atmospheric changes constitute the vital factor in weather conditions.

For other details bearing on this subject consult in these volumes the articles on air brake, air pump, compressed air, liquid air, wind and storms.

ATMOSPHER'IC ELECTRICITY, the electricity manifested by the atmosphere. See AURORA BOREALIS; LIGHTNING.

ATOLL', a coral reef surrounding a pool of shallow water, usually called a lagoon. The atoll is formed by the building of a coral reef on a circular or nearly circular foundation. It is usually broken in one or more places so that the lagoon is connected with the surrounding waters. See CORAL.

ATOLL

AT'OM. In chemistry an atom is the smallest particle into which an element can be divided by chemical reactions. It is the subdivision of a molecule (see MOLECULE). For example, consider a molecule of water; it is composed of two parts of hydrogen and one part of oxygen. As long as the substance remains water it is formed from these elements united in this way; but if it be separated chemically, it is divided into two atoms of hydrogen and one atom of oxygen. It cannot be subdivided further. For a more extended treatment of this subject see the article CHEMISTRY, subhead *Atoms*.

ATOM'IC THE'ORY, a theory proposed by the English chemist John Dalton in the early part of the nineteenth century to explain chemical action. He believed that all matter is composed of very small particles, called atoms, which cannot be divided into anything smaller. He thought that these atoms, by uniting together, caused chemical changes.

There are several laws which have been laid down to govern chemical reaction. From one we learn that in any substance the elements forming it are always present in the same proportion by weight. From another law we find that when one element, like nitrogen, for example, unites with oxygen in several proportions by weight, the different proportions of oxygen are simple multiples of a common factor. A third law tells us that different elements which combine with a constant weight of one element combine in the same proportions with the constant weight of another element.

ATOMIC WEIGHTS. By carefully weighing numerous compounds, chemists have determined that there is a certain fixed ratio between the smallest amount of any element capable of existing in a compound and the weight of the same quantity of hydrogen existing under similar conditions. This fixed number is called the atomic weight of the element. In other words, the atomic weight of any element is the number which shows how many times heavier than an atom of hydrogen is an atom of that element.

In the standard system recommended by a committee of German chemists, now generally in use, the basis is sixteen, the atomic weight of oxygen, which makes the weight of hydrogen 1.008 instead of 1. Below is given a list of atomic weights for the more important elements:

NAME	ATOMIC WEIGHT	NAME	ATOMIC WEIGHT
Aluminum	27.1	Mercury	200.6
Antimony	120.2	Nickel	58.68
Arsenic	74.96	Nitrogen	14.01
Bismuth	208.0	Osmium	190.9
Bromine	79.92	Oxygen	16.0
Carbon	12.005	Palladium	106.7
Chlorine	35.46	Platinum	195.2
Cobalt	58.97	Radium	226.0
Copper	63.57	Silver	107.88
Fluorine	19.0	Sulphur	32.06
Gold	197.2	Tin	118.7
Iodine	126.92	Tungsten	184.0
Lead	207.2	Uranium	238.2
Magnesium	24.32	Zinc	65.37

ATONE'MENT, as used commonly to-day, means that which is done to bring about a reconciliation between persons at variance; but the doctrine of atonement in theology considers what is necessary to bring man into union with God, from whom he has been separated by sin. It is on this point that Christianity differs from heathenism. Various ideas were held among the early Church fathers concerning the manner in which the death of Christ was a sacrifice for our sins, a delivery from the power of Satan. Many early Christians asserted that God offered Christ to Satan. Anselm's interpretation, that Christ offered his life to God, for which

God granted forgiveness of the sins of men, has been accepted by Protestants and Catholics, though different sects give various modifications to the doctrine.

A'TRIUM, the entrance hall and central room of an old Roman house. This general room served as a living room in which the family ate and slept and in which were kept the Lares and Penates (see LARES AND PENATES). It had a roof which sloped downwards towards the center, so that the rain water ran into a cistern in the floor beneath. As the houses increased in size, the style of the atrium changed, and under Augustus there was a series of columns forming a regular colonnade along the central opening. The houses of Pompeii furnish the best examples of atria which have been preserved. The term *atrium* is also applied to a large open court in front of a temple or public building, and also to the court in front of a basilical church, containing a fountain for ablutions, where penitents gathered to supplicate. This use of the atrium was discontinued in the early Middle Ages.

ATROPHY, *at'ro fy*, a wasting of any part of the body due to some interference in nutrition. It may arise from a variety of causes, such as organic disease, a want of proper food or of pure air or suppurations in important organs; it is also sometimes produced by poisons, such as arsenic, mercury and lead, afflicting miners, painters, gilders and persons following similar occupations. In old age the whole frame except the heart undergoes atrophic change, and it is of frequent occurrence in infancy as a result of improper, unwholesome food and exposure to cold, damp or impure air. Single organs or parts of the body may be affected, irrespective of the general state of nutrition; thus, local atrophy may be caused by palsies, the pressure of tumors upon the nerves of the limbs or by artificial pressure. The degeneration of an organ which has ceased to function, as in case of the eyes of the blind fish in Mammoth Cave, is also called atrophy.

AT'ROPOS. See FATES.

ATTACH'MENT, in law, the order of a court and the process by which an officer of the law seizes a certain person or property connected with an action at law. The writ of attachment against a person was formerly issued to bring a debtor before the court, but this use of the writ has been practically abandoned, and in the United States attachment against a person is issued only for contempt of court. The writ of attachment against property is commonly used to prevent the fraudulent removal or concealment of the goods before some question concerning it can be settled at law, or before a judgment against it can be satisfied.

ATTAIN'DER, the extinction of civil rights following upon a sentence of death or outlawry, in punishment for high crimes. In England common law attainder resulted in the forfeiture of all the victim's property, and it also produced corruption of blood, that is, it prohibited the attainted person from inheriting property or transmitting it to his heirs. These provisions were later modified by statute and the latter has been abolished. The United States Constitution contains the following provision: "No attainder of treason shall work corruption of blood or forfeiture, except during the life of the person attainted." Many state constitutions have similar provisions. See BILL OF ATTAINDER.

AT'TAR, in the East Indies, a general term for a perfume from flowers; in Europe and America generally used only of the *attar,* or *otto, of roses,* an oil made from the petals of several species of roses. It is manufactured chiefly in Syria, Persia, India, Turkey and Bulgaria. The oil is at first greenish, but afterward it presents various tints of green, yellow and red. It is frequently adulterated with oils of rhodium, sandalwood and geranium, with the addition of camphor or spermaceti. The attar is packed and exported in very slender glass bottles. Since 100,000 roses yield only 180 grains of the perfume, it is very expensive, three or four drops costing a dollar or more.

ATTEN'TION, the directing of the mind's energies to a definite purpose. Attention depends upon the condition of the brain and the attraction furnished by the object. It requires the expenditure of nerve force, and when the brain cells are unwearied less stimulus is necessary than when one is fatigued. This is illustrated by the activity of a child in the early part of the day. He is then interested in and gives his attention to many things which, when fatigued, he will scarcely notice. This law is also true of the adult. It requires greater effort to hold the attention upon a subject when one is tired, and for this reason strenuous mental work is usually accomplished with less effort in the

early part of the day. Attention is usually classified as *non-voluntary* and *voluntary*, though other classifications have been adopted by some authorities.

Non-voluntary Attention. The non-voluntary is without effort or fixed purpose, while the voluntary is directed by the will towards a definite purpose. Non-voluntary attention is characteristic of early childhood, and its activity is aroused by external objects. It is transitory and without motive, but it merges into voluntary attention so quickly that the two phases are not always distinguishable, and what is frequently termed non-voluntary is voluntary attention. Just as soon as an object which excites non-voluntary attention is sought for a purpose, the attention upon it becomes voluntary, as in the case of a child having his attention arrested by a flower; no sooner does he see it than he desires to possess it. His non-voluntary attention has then become voluntary. But before he has obtained the flower, some other object having a stronger attraction may secure his attention, and he will leave the flower and follow the new object. Because of these changes we often consider the child's attention to be wholly of the non-voluntary sort. This, however, is due to his apparent lack of purpose.

Voluntary Attention. Voluntary attention is under control of the will and is roused through interest in an object more or less remote, the attainment of which requires effort. A pupil's attention is not drawn to a problem in arithmetic so much by the problem itself as by the ability which its solution will give him. A boy climbs to the top of a toboggan slide, not for the purpose of reaching the highest point, but because he wishes to slide down, and getting to the top is a necessary step toward the desired end. Interest is the foundation of voluntary attention, and the mind never gives heed to those things which have no significance. Objects of interest include impressions from the external world received through the senses, and those arising from the operations of the mind itself, such as memory and imagination. The external impressions form by far the larger class. The amount of effort necessary to fix the attention upon an object depends upon our interest in the object and our condition of mind. Strong stimuli, such as those produced by the ringing of a bell or the firing of a gun, call for but little effort, but their effect is usually transitory. Those subjects in which we are deeply interested call for but little effort, while those concerning which we know but little, or in which we feel only a slight interest, require great effort to enable us to hold our attention upon them. However, as we learn more of a subject our interest in it usually increases, and the effort necessary to hold attention upon it becomes less and less, until we are frequently absorbed in the subject. Complete absorption is the highest degree of attention and is reached only in cases of the most intense mental activity. In such a state one may be spoken to and not hear, may fail to notice the presence of others, or may even receive bodily injury without being aware of it at the time.

Laws of Attention. Attention is the foundation of all knowledge, and its development and training are essential to a well-disciplined mind. These are in accordance with certain principles and laws which should be understood by the parent and teacher:

(1) Attention grows with the development of the nervous system. In the young child it is almost wholly involuntary, while in the educated adult it is almost wholly voluntary. The first work of the parent and teacher is to change the non-voluntary to voluntary attention.

(2) Attention is a selective activity. Whatever ideas are in our minds are there because at some time in life we willed to put them there. Attention singles out or abstracts one object from among many crowding upon the mind, and directs our activity to it. It also suppresses other objects so as to make the principal object of our desires stand out clearly in consciousness. Since the child is unable to make the fine distinctions, he can hold in consciousness only the larger features and relations of objects, such as form, color and odor, while the trained intellect is able to make finer distinctions.

(3) Attention can be fixed only upon those objects and ideas which have some meaning, that is, which point to something beyond themselves. Therefore, in training the attention of children, those subjects which have significance in the child's life should be used. Each lesson should bring out something new, but this should be so related to the knowledge already in the mind that it can be readily understood. The effort of attention is lessened in proportion as the interest is increased.

(4) Attention can be held for only a short time on an object that does not change; hence, the teacher should so plan her lessons as to give such variety as will hold the attention of her pupils, and at the same time return again and again to the leading idea, until it is comprehended.

(5) Attention requires effort and is followed by fatigue. For this reason lessons for young children should be short, seldom exceeding ten minutes, and if the activity required is intense the time should be shorter. Each period of intense activity should be followed by a period of relaxation, when the children engage in play or are provided with an entirely different occupation.

(6) Attention becomes habitual. It is therefore important that this power be rightly trained during childhood and youth. Because of inability to hold their attention upon a subject for any length of time, many people fail to accomplish difficult tasks.

In the article Psychology will be found type questions on attention. The reader is also referred to articles in these volumes on association of ideas, habit, interest and perception.

AT'TICA, the triangular peninsula that forms the southeastern extremity of Greece. In ancient times it was the home of the greatest artists and writers of Greece, and its capital city, Athens, was the center of a great empire. Modern Attica, a department of Greece, has a population of about 341,000.

AT'TILA, the famous leader of the Huns, one of the most cruel of conquerors. He succeeded, with his brother Bleda, to the domain of his uncle Roas in A. D. 434. The rule of the two leaders extended over a great part of northern Asia and Europe, and they threatened the Eastern Empire and twice compelled the weak Theodosius II to purchase peace. Attila had his brother murdered about 445, and in a short time greatly extended his dominions. Thrace, Macedon and Illyria were overrun, and then Attila turned his attention to the West. He met the allied armies of the emperor and the Visigothic king, Theodoric, at Chalons, and was defeated after a bloody battle. In 452 he entered Italy, but was prevented from attacking Rome by Pope Leo I. Attila died suddenly on the night of his marriage with Hilda (or Ildico), while he was preparing for another invasion of Italy. The description of Attila which has come down to us states that he had a large head, a flat nose, broad shoulders and a short and ill-formed body, but that his eyes were brilliant, his walk stately and his voice strong and well-toned.

ATTORNEY-GENERAL. See JUSTICE, DEPARTMENT OF.

AUBER, *o bare'*, DANIEL FRANÇOIS ESPRIT (1782–1871), a French operatic composer, whose musical scores are remarkable for beautiful melody and spirit. More than forty operas testify to his incessant labor and power of originality. Of these, the best are *Masaniello* (1828) and *Fra Diavolo* (1830).

AU'BURN, ME., founded in 1789, is the county seat of Androscoggin County, thirty-five miles north of Portland, on the Androscoggin River and on the Boston & Maine and the Maine Central railroads. One of the largest shoe factories in the United States is located here, and there are also manufactures of cotton goods and lumber. There is a public library and the city has three private hospitals and a home for aged women. Population, 1910, 15,064; in 1917, 16,607 (Federal estimate).

AUBURN, N. Y., founded in 1792, and since 1805 the county seat of Cayuga County, is situated seventy-seven miles southeast of Rochester and twenty-six miles southwest of Syracuse. It is on Owasco Lake and on the New York Central and Lehigh Valley railroads. The industries include a plant of the International Harvester Company and a large rope manufactory. About 7,000 people are employed in the city's industrial life. Here is located the state penitentiary, for many years considered a model penal institution, conducted on advanced humane lines. The city has seven banks and one trust company, a notable theological seminary (Presbyterian), a city library and two public hospitals. Situated in the heart of the lake country of the state, Auburn and vicinity attract many summer visitors. Population, 1916, 34,668; in 1917, 37,823 (Federal estimate).

AUCKLAND, *awk'land*, NEW ZEALAND, the principal town of Auckland province, in North Island, is situated on the beautiful Waitemata harbor, an arm of the Hauraki Gulf. Until 1865 Auckland was the capital of New Zealand. It is now the port of call for Oceanic mail steamers plying between San Francisco and Sydney, Australia, being 1,315 miles from the latter city and 5,440 miles from the former. There is a regular steamship connection with Australia, South Africa, Great Britain, America and the islands of the Pacific. Auckland is a manufacturing center of importance and carries on an active trade in lumber. It has many fine public buildings, a university and a splendid public library. Population in 1911, 40,536; including suburbs, 102,676.

AUC'TION, the public sale of an article to the party offering the highest price, or to

the bidder who first accepts the terms offered by the vender where he sells by reducing his terms until some one accepts them. The latter form is known as a *Dutch auction.* A sale by auction must be conducted in the most open and public manner possible; and there must be no collusion on the part of the buyers. Puffing or mock bidding to raise the price by apparent competition is illegal. A bid is an offer and when accepted forms a binding contract (see CONTRACT).

AUDIPHONE, *aw'de fone,* or **DENTIPHONE,** an instrument by means of which deaf persons are enabled to hear. It consists essentially of a fan-shaped plate of hardened rubber, having a handle at one end and a string attached to the opposite end. The plate is bent downward by pulling on the string, thus forming a concave surface which collects the sound waves and transmits them to the teeth, from which they are conveyed to the auditory nerve through the bones of the face. The audiphone is of use to people whose deafness is caused by defects in the external or middle ear. It is useless to one whose auditory nerve is destroyed. See EAR.

AU'DUBON SOCIETY, an organization which has for its object the dissemination of information about common birds, in order to prevent their destruction and to create a sentiment against the wearing of birds and feathers as articles of adornment. There are Audubon Societies in various parts of North America, and these have enrolled thousands of members pledged to carry out the aims of the organization. In many states and provinces the killing of non-game birds is forbidden at all times, and through the influence of the Audubon movement many bird reservations have been established. *Bird Lore,* a bimonthly magazine, is the official organ of the society.

John James Audubon (1780–1851), largely through whose influence the bird-protection movement originated, was born at Mandeville, La., of French parentage. He was educated in France, and studied painting under David. In 1798 he settled in Pennsylvania, where he lived for ten years, devoting his time to the study of birds and to making drawings in natural history. In 1826 he went to England, exhibited his drawings in Liverpool, Manchester and Edinburgh, and finally published them in an unrivaled work, containing four hundred thirty-five colored plates of birds the size of life, entitled *The Birds of America.* Later there appeared an accompanying text entitled *Ornithological Biography,* partly written by William Macgillivray. On his return to America Audubon labored with Dr. Bachman on a finely illustrated work entitled *The Quadrupeds of America.* His great merit is the accuracy and extent of his original observations.

AUGEAS, *aw'je as,* a mythical king of Elis, in Greece, who figures in the story of the sixth exploit of Hercules (which see).

Augean Stables. King Augeas had 3,000 head of oxen which he kept in his stables. These stables had not been cleaned for thirty years. Hercules undertook to clear away the filth in one day in return for a tenth part of the cattle, and executed the task by turning the Alpheus and Peneus rivers through the stables. Augeas, having broken the bargain, was deposed and slain by Hercules. In current speech "to cleanse the Augean stables" is a synonym for improving disgraceful political conditions.

AUGITE, *aw'jite,* or **PYROXENE,** a mineral of the hornblende family, an essential component of many igneous rocks, such as basalt, greenstone and porphyry. A transparent green variety found at Zillerthal, in the Tyrol, is used in jewelry.

AUGSBURG, *owgs'boorg,* BAVARIA, a renowned commercial center in the Middle Ages, and still an important emporium of South German and Italian trade. There are many beautiful churches, some of which date from medieval times, among them being the cathedral and the memorial chapel of the Fugger family. Other important buildings are the town-hall, which contains the celebrated Golden Hall, one of the finest halls in Germany, and the former episcopal palace, in which, in 1530, the Augsburg Confession was presented to the emperor, Charles V. Besides these there are several beautiful modern buildings, a theater, a library and a splendid gallery of paintings. The chief industries are cotton spinning and weaving, dyeing, woolen manufacture, book printing and binding and the manufacture of machinery, metal goods and chemicals. Augsburg is a place of great antiquity, Emperor Augustus having established a colony here about 12 B. C. In 1276 it became a free city, and, besides being a great mart for the commerce between the north and south of Europe, it was a great center of German art in the Middle Ages. It early took a conspicuous part

in the Reformation. In 1806 it was incorporated in Bavaria. Population, 1910, 102,487.

AUGSBURG CONFESSION. The Emperor Charles V, with the aim of arranging the difficulties between the Catholic and Protestant parties in Germany which were the result of the Reformation, called a diet in 1530 and requested the Protestants at that time to present a statement of their beliefs. Luther was under the ban of the Empire and could not attend the diet, and the confession was therefore drawn up by Melanchthon and revised by Luther before being read. Charles V and the Catholics would not accept the document, and the two divisions of the Church soon separated completely. From that time the Augsburg Confession has been regarded as the expression of the creed of the Lutheran Church.

AU'GURS, a board or college of diviners who, among the Romans, predicted future events and announced the will of the gods. Their predictions were determined by signs in the sky, especially thunder and lightning; by the flight and cries of birds; by the feeding of the sacred chickens; by the course taken or sounds uttered by various quadrupeds or by serpents; by accidents or occurences, such as spilling the salt or sneezing. The answers of the augurs, as well as the signs by which they were governed, were called auguries, but bird-predictions were properly termed auspices. Nothing of consequence could be undertaken without consulting the augurs, and by the mere utterance of the words *alio die* (on another day) they could dissolve the assembly of the people and annul all decrees passed at the meeting.

AU'GUST, the eighth month from January. It was the sixth of the old Roman year, and hence was originally called *Sextilis*. When Julius Caesar reformed the calendar he made *Sextilis* the eighth month, thus making its name inappropriate. Later Augustus was given an opportunity to select a month to be named in his honor, and he chose the one following July, because it was associated with most of his triumphs and honors. Thus the new eighth month was named August. At that time it had but thirty days, and to make it equal in length with July, the honor month of Julius Caesar, it was given an extra day. February was selected to give up the needed day, which left that month but twenty-eight days. In the north temperate zone August is a very hot month, for it brings the apex of summer's heat. It is also usually free from storms of wind and rain, and is the favorite season for excursion trips to cool resorts. The poppy is the special flower of August, and its gem is the sardonyx.

Special Days for Observance. There are no national holidays in August for Canadians or Americans, but two of the states observe in this month their respective dates of admission into the Union, Colorado, on the 1st, and Missouri on the 10th.

Anniversaries for Celebration. The following birthdays of notable people fall in August:

Richard Henry Dana, August 1, 1815.
F. Marion Crawford, August 2, 1854.
Duncan Campbell Scott, August 2, 1862.
Percy Bysshe Shelley, August 4, 1792.
Alfred Tennyson, August 6, 1809.
Lord Strathcona and Mount Royal, August 6, 1820.
Nelson A. Miles, August 8, 1839.
Izaak Walton, August 9, 1593.
Francis Scott Key, August 9, 1780.
Robert Southey, August 12, 1774.
Goldwin Smith, August 13, 1823.
Sir James Douglas, August 14, 1803.
Ernest Thompson Seton, August 14, 1860.
Napoleon Bonaparte, August 15, 1769.
Sir Walter Scott, August 15, 1771.
Thomas DeQuincey, August 15, 1785.
David Crockett, August 17, 1786.
Virginia Dare, August 18, 1587.
Meriwether Lewis, August 18, 1774.
James Nasmyth, August 19, 1808.
Benjamin Harrison, August 20, 1833.
John B. Gough, August 22, 1817.
William Wilberforce, August 24, 1859.
Francis Bret Harte, August 25, 1839.
Sir Robert Walpole, August 26, 1676.
Sir Edward Burne-Jones, August 28, 1833.
John Locke, August 29, 1632.
Oliver Wendell Holmes, August 29, 1809.
Elizabeth Stuart Phelps, August 31, 1844.

The following important events occurred in August:

Columbus first landed on the American continent, August 1, 1502.
Battle of the Nile, August 1, 1798.
Colorado admitted to the Union, August 1, 1876.
Germany declared war on Russia, August 1, 1914.
Henry Hudson first entered Hudson Bay, August 2, 1610.
Columbus sailed from Spain on his first voyage, August 3, 1492.
Abolition of nobility titles in France, August 4, 1789.
Election of Pope Pius X, August 4, 1903.
Germans invaded Belgium, August 4, 1914.
Great Britain declared war on Germany, August 4, 1914.

France declared war on Germany, August 4, 1914.
Sir Humprey Gilbert landed at Saint Johns, Newfoundland, August 5, 1583.
First partition of Poland, August 5, 1772.
Abolition of title of Holy Roman Emperor, August 6, 1806.
General Foch made marshal of France, August 6, 1918.
Battle of Thermopylae, August 7, 480 B. C.
Napoleon sailed for Saint Helena, August 8, 1815.
Signing of Webster-Ashburton Treaty, August 9, 1842.
Coronation of Edward VII, August 9, 1902.
Missouri admitted to the Union, August 10, 1821.
Trial trip of Fulton's Clermont, August 11, 1807.
Organization of first American field army in France announced, August 11, 1918.
Boundary dispute between Ontario and Manitoba settled, August 11, 1884.
First American railway joined Schenectady and Albany, N. Y., August 12, 1830.
United States and Spain signed peace proposals, August 12, 1898.
Surrender of Manila to American forces, August 13, 1898.
Norway voted for separation from Sweden, August 13, 1905.
Fort Dearborn massacre, August 15, 1812.
Lafayette's return visit to America, August 15, 1824.
Battle of Bennington, August 16, 1777.
Capture of Detroit by General Brock, August 16, 1812.
Surrender of the Guerriere to the Constitution, August 19, 1812.
Parliament passed a bill for the Union of South Africa, August 19, 1909.
Pilgrims sailed from England in the Mayflower, August 20, 1620.
Lincoln-Douglas debates began, August 21, 1858.
Battle of Bosworth, August 22, 1485.
Massacre at Montreal by Iroquois Indians, August 25, 1689.
Fort Frontenac, Canada, captured by the English, August 27, 1758.
British Parliament abolished slavery in the colonies, August 28, 1833.
Founding of Melbourne, Australia, August 29, 1835.
Second Battle of Bull Run, August 30, 1862.
Earthquake at Charleston, S. C., August 31, 1886.
(See other months for similar lists.)

AUGUS'TA, GA., founded in 1736, is the county seat of Richmond County, on the Savannah River, 300 miles from its mouth, and on the Georgia, the Central of Georgia, the Southern, and minor railroads. Atlanta is 171 miles northwest, and Charleston, S. C., on the Atlantic, is 136 miles southeast. It is claimed for the city that it is the second largest inland cotton market in the world. Its manufactures include cotton goods, cottonseed oil products and the making of bagging and ties. In 1917 a fine Federal building was completed at a cost of $350,000; there is a large courthouse, a seventeen-story office building, Saint Joseph's Academy, two public libraries and four hospitals. The Medical College, located here, is a part of the state university at Athens. In 1916 the city suffered a $7,000,000 loss by fire, which rendered 3,000 people homeless. Twenty city blocks were burned. Population, 1910, 41,040; in 1917, 50,642 (Federal estimate).

AUGUSTA, ME., founded in 1754 as Cushnoe, incorporated as Hallowell in 1771, and soon thereafter given its present name, has been the capital of the state since 1831. It is at the head of navigation on the Kennebec River, forty-five miles from its mouth, and is on the Maine Central Railroad. Portland is sixty-one miles southwest. The industries include the manufacture of cotton goods, shoes, lumber and paper; the publishing interests are important. The city is the location of the Maine insane asylum, and there are two hospitals. The state capitol has recently been rebuilt. Population, 1910, 13,211; in 1917, 14,325 (Federal estimate).

AUGUSTAN AGE, a name applied to a period in Roman literature in which Horace, Ovid, Vergil and other noted writers flourished. The name refers to the Emperor Augustus, who ruled at this time and gave encouragement to men of talent. In England the age which produced Addison, Steele and Swift is called the Augustan, and a period of literary activity in France during the reign of Louis XIV also bears the name.

AUGUSTINE, AURELIUS AUGUSTINUS, SAINT (354–430), a renowned father of the Christian Church. It is said that "he molded the spirit of the Christian Church for centuries," and both Protestants and Catholics appealed, during the Reformation, to his authority. In his youth he was sent to Carthage to be educated, and there he entered into the vices and gay life of the time. In 383 he went to Rome and thence to Milan, where he came under the influence of Saint Ambrose and was converted to Christianity. After his conversion Augustine divided his goods among the poor, retired to private life and gained a reputation by his writings. He was a man of great enthusiasm and powerful intellect, and his *Confessions* form a remarkable autobiography.

AUGUSTINE, *aw'gus tine*, or **AUS'TIN**, SAINT, the *Apostle of the English*, flourished at the close of the sixth century. He was sent with forty monks by Pope Gregory I to introduce Christianity into Saxon England, and was kindly received by Ethelbert, king of Kent, whom he converted, baptizing 10,000 of his subjects in one day in the River Swale.

AUGUS'TUS, CAIUS JULIUS CAESAR OCTAVIANUS (63 B. C.–A. D. 14), the first of the Roman emperors, originally called Caius Octavius. He was the son of Caius Octavius and Atia, a daughter of Julia, the sister of Julius Caesar. After Caesar's death Octavius returned to Rome to claim Caesar's property and avenge his death, and now took, according to usage, his uncle's name with the surname Octavianus. After a struggle with Antony, in which Antony was overcome, Octavianus succeeded in getting himself chosen consul, and soon afterwards, having effected a reconciliation with Antony, he formed, with him and Lepidus, the second triumvirate. This alliance resulted in a proscription, in which three hundred senators and two thousand knights were put to death.

The next year Octavianus and Antony defeated the republican army under Brutus and Cassius at Philippi, and the victors then divided the Roman world between them, Octavianus taking the West, Antony the East and Lepidus Africa. Sextus Pompeius, who had made himself formidable at sea, was now put down; and soon after, Lepidus, who had hitherto retained an appearance of power, was deprived of all authority and retired into private life. Antony and Octavianus now shared the Empire between them; but while the former, in the East, gave himself up to a life of luxury and alienated the Romans by his alliance with Cleopatra and his adoption of Oriental manners, Octavianus skilfully cultivated popularity and soon declared war against the queen of Egypt. The naval victory of Actium, in which the fleet of Antony and Cleopatra was defeated, made Octavianus master of the world, 31 B. C.

He returned to Rome, celebrated a splendid triumph and caused the temple of Janus to be closed as a sign of universal peace. Gradually all the highest offices of state, civil and religious, were united in his hands, and the new title of *Augustus* (sacred) was formally conferred by the senate in 27 B. C. Under him successful wars were carried on in Africa and Asia, in Gaul and Spain, in Pannonia and in Dalmatia; but the defeat of Varus by the Germans under Arminius, with the loss of three legions, A. D. 9, was a great blow to him. He adorned Rome in such a manner that it was said, "He found it of brick, and left it of marble." The people erected altars to him, and by a decree of the senate, the month Sextilis was called *Augustus*. His death, which took place at Nola, plunged the Empire into the greatest grief. Augustus was thrice married, but had no son, and was succeeded by his stepson, Tiberius. During the reign of Augustus Christ was born.

AUGUS'TUS I, FREDERICK (Augustus II of Poland, 1670–1733), elector of Saxony and king of Poland. He succeeded his brother in the electorate in 1694, and when the Polish throne became vacant, by the death of John Sobieski, Augustus secured it. He joined with Peter the Great in the war against Charles XII of Sweden. In 1704 he was deposed, but after the defeat of Charles at Pultava, the Poles recalled him. On the death of Charles XII, Augustus concluded a peace with Sweden.

AUGUSTUS II, FREDERICK (Augustus III of Poland) (1696–1763), elector of Saxony and king of Poland, son of Augustus I, succeeded his father as elector in 1733 and was chosen king of Poland through the influence of Austria and Russia in the same year. Assisted by Russian troops he drove Stanislaus Lesczynski, who sought to recover his throne, from Poland, and in June, 1736, he was generally accepted as king. In 1756, at the beginning of the Seven Years' War, Augustus aided Maria Theresa against Frederick the Great, but before the end of the year his forces had been scattered and he himself fled from Dresden to Poland, leaving Saxony under Frederick's dominion until the end of the war.

AUK, a general name for certain swimming birds common in the polar regions. There are but two species of the auks proper, the great auk and the razor-bill. The great auk, a bird about three feet in length, was formerly plentiful in the northern regions and was known to visit the British Isles, but within the knowledge of man it has become extinct. In museums, however, there are some seventy skins, a number of eggs and the skeletons of still more individuals. The

wings of the great auk were only about six inches in length and totally useless for flight, but were employed vigorously as fins in swimming, especially while the bird was diving. The tail was about three inches long and the legs of the bird were placed so far back that when on land the bird seemed to stand erect. The head, neck and upper parts

GREAT AUK

of the bird were black, but a large spot under each eye and most of the under parts were white.

The razor-bill is about fifteen inches in length and can use its wings in flight. Thousands of these birds are killed on the coast of Labrador for their breast feathers, which are thick and warm. Among the species grouped with the auks are the tufted puffin and the rhinoceros auklet of the North Pacific, the black guillemot of the North Atlantic, the murre or common guillemot, which migrates from Spitzbergen southward to the New England states, and the little auk of Greenland and northern Iceland. These birds spend the winter in the open seas, but in spring they come to land, where each pair claims its little space of ground on which is laid its single egg. There are localities on the northeastern coast of North America where thousands of these birds, sometimes representatives of several different species, may be seen sitting close together, each protecting its own egg, which it holds upon its webbed feet and covers with its body.

AULD LANG SYNE, *awld lang sine,* the title of a Scotch ballad supposed to have been written by Robert Burns. It is probable that the poet rewrote an old song and added other stanzas. The title means *old long since,* or *the days gone by.* The well known melody to which the words are everywhere sung is an old Scottish tune. Below are given the first stanza and the refrain:

Should auld acquaintance be forgot,
And never brought to min'?
Should auld acquaintance be forgot,
And days o' auld lang syne?

For auld lang syne, my dear,
For auld lang syne,
We'll tak' a cup o' kindness yet,
For auld lang syne.

AURE'LIAN, LUCIUS DOMITIUS AURELIANUS (about 212–275), emperor of Rome. He was of humble origin, rose to the highest rank in the army, and on the death of Claudius II in 270 was chosen emperor. He delivered Italy from the barbarians, conquered the famous Zenobia, queen of Palmyra, and followed up his victories by the reformation of abuses and the restoration throughout the Empire of order and regularity. He was assassinated while heading an expedition against the Persians.

AURE'LIUS, MARCUS (surnamed *Antoninus*) (A. D. 121–189), often called simply Marcus Aurelius, a Roman emperor and philosopher, the adopted son and successor of Antoninus Pius. He succeeded to the throne in 161. Brought up and instructed by Plutarch's nephew, Sextus, the orator Herodes Atticus and the jurist L. Volusius Mecianus, he had become acquainted with learned men and had formed a great love for the Stoic philosophy. A war with Parthia broke out in the year of his accession and did not terminate till 166. On his return from this struggle he was obliged to turn his attention to the German tribes who were menacing the Roman state. His brother Verus had died, and the sole command of the war devolved on Marcus Aurelius, who prosecuted it with the utmost vigor, compelling the Marcomanni and other tribes to sue for peace.

The sedition of the Syrian governor Avidius Cassius, with whom Faustina, the empress, was in treasonable communication, called the emperor from his conquests, but before he reached Asia the rebel was assassinated. Aurelius returned to Rome, after visiting Egypt and Greece, but soon new incursions of the Marcomanni compelled him once more to take the field. He defeated the

enemy several times, but his activities had exhausted him and he died in the midst of his wars. His only extant work is the *Meditations,* which has been translated into most modern languages, and which contains many beautiful passages that are everywhere familiar. Aurelius was one of the best emperors Rome had, although his philosophy and the magnanimity of his character did not restrain him from the persecution of the Christians, whose religious doctrines he was led to believe were subversive of good government.

AURO'RA, in classical mythology, the goddess of the dawn, daughter of Hyperion and Thia, and sister of Helios and Selene (Sun and Moon). She was represented as a charming figure, "rosy-fingered," clad in a yellow robe, rising at dawn from the ocean and driving her chariot through the heavens. Among the mortals whose beauty captivated the goddess, poets mention Orion, Tithonus and Cephalus.

A reproduction of Guido Reni's famous painting Aurora and a type lesson on the subject will be found in the article Painting.

AURO'RA, Ill., founded in 1834 and named for the goddess Aurora, in Kane County, thirty-eight miles west of Chicago, on the Fox River, whose valley is famous for its beauty, and on the Chicago, Burlington & Quincy, the Chicago, Elgin & Aurora (interurban) and the Chicago, Milwaukee & Gary railroads. There are four city parks, two of them of fifteen and twenty acres. Railroad shops of the Chicago, Burlington & Quincy are located here, and there are over a dozen plants employing 300 men each.

The city has Jennings Seminary, for girls, an Adventist college, two musical colleges, a Carnegie Library and three hospitals. Aurora became a city in 1857. Population, 1910, 29,807; in 1917, 34,795 (Federal estimate).

AURO'RA BO REA'LIS, or **NORTHERN LIGHTS,** the name of a peculiar light seen in the sky at night, usually in the northern portion of the heavens. A similar light in the southern hemisphere is called the *Aurora Australis.* The northern aurora has been far the most observed and studied. It usually manifests itself by streams of light ascending toward the zenith from a dusky line of cloud or haze a few degrees above the horizon and stretching from the north toward the west and east, so as to form an arc with its ends on the horizon. Its different parts and rays are constantly in motion. Sometimes it appears in detached places; at other times it almost covers the sky.

It assumes many shapes and a variety of colors, from a pale red or yellow to a deep red or blood color; and in the northern latitudes serves to illuminate the earth and cheer the gloom of the long winter nights. When electricity passes through rarefied air it exhibits a diffused luminous stream which has all the characteristic appearances of the aurora, and hence it is highly probable that this light is occasioned by the passage of electricity through the upper regions of the atmosphere. The connection between the aurora and magnetism is also evident from the fact that the magnetic needle is strongly affected by it. See Electricity; Magnetism.

AUSTEN, Jane (1775–1817), an English novelist whose works give a remarkably clear picture of the manners and standards of her day. Her work was greatly admired by Sir Walter Scott and other eminent writers. Miss Austen's *Sense and Sensibility, Pride and Prejudice, Mansfield Park, Emma, Northanger Abbey* and *Persuasion,* absolutely free from sensationalism in style and plot and giving unadorned pictures of the lives of the middle classes and gentry, are always interesting.

AUSTERLITZ, *ows'tur litz,* Moravia, a town in Austria-Hungary, ten miles east of Brunn, famous for the battle in 1805, in which Napoleon with 70,000 men defeated the allied Austrian and Russian armies with 95,000 men. The decisive victory of the French led to the Peace of Pressburg between France and Austria. Population, 1910, about 4,000.

AUSTIN, Alfred (1835–1913), an English poet, born near Leeds, the successor of Tennyson as poet laureate of England. After graduating at the University of London, he was called to the bar, but soon gave up the law for literature. In 1896 he was made poet laureate, holding this position until his death, when

ALFRED AUSTIN

he was succeeded by Robert Bridges. Among his poetical works are *English Lyrics, Songs of England* and *A Tale of True Love and Other Poems,* dedicated to Theodore Roosevelt. His critical notes in the *National Review* are interesting, and his essay, *The Poetry of the Period,* has attracted much attention.

AUSTIN, Stephen Fuller (1793–1836), a Texas pioneer and founder of the city of Austin. He led a company of colonists to Texas in 1821 and settled on a tract of land granted to his father in 1820. In 1833 he was delegate to Mexico to obtain ratification of the Texan constitution, and in 1835 he was made commander of the Texan revolutionists and went to Washington to secure the recognition of the independence of the Texan republic. He died soon after his return to Texas.

AUSTIN, Tex., the capital of the state and the county-seat of Travis County, 160 miles northwest of Houston, on the Houston & Texas Central, the Missouri, Kansas & Texas, the International & Great Northern and other railroads. The city was founded soon after 1830 as Waterloo, but in 1837 received its present name, in honor of Stephen F. Austin (which see), the "father of Texas." In 1839 it was incorporated as a city. The Colorado River passes through the city, but it will not be navigable until deepened through Congressional appropriation, which was pending in 1919.

The city's most prominent building is the great state capitol, one of the finest and largest of its kind in the United States, built at a cost of $3,500,000. The state university, located here, has buildings and grounds to the value of $2,500,000. There are old and new post office buildings, the former now used for offices. The industries have to do largely with cotton, there being large cottonseed oil mills, gins, etc.; the city also has soap and mattress factories. There is an extensive wholesale trade and a large market for live stock, grain and hides.

Austin is the seat of the state institution for the blind and the state deaf and dumb school. There is no city library, for the large university library and that at the state capitol are available. The people are largely American; there are a few Mexicans. Population, 1910, 29,860; in 1917, 35,612 (Federal estimate).

AUSTRALASIA, *aws tral a'she ah.* See Oceania.

AUSTRALIA, *aws tra'li a,* the largest island in the world, so large that it is rated as a continent, and with the island of Tasmania it constitutes the Commonwealth of Australia, under the British crown. The area of the entire Commonwealth is 2,948,366 square miles. All of Europe is only 700,000 square miles larger; it is two-fifths as large as all of North America; if Maine and Florida were cut from the United States Australia would exceed in area the remaining forty-six states.

The Commonwealth lies southeast of the Asiatic mainland. Between the two land masses are many islands, believed by geologists to be the unsubmerged parts of a connecting belt of land which in past ages connected Australia and Asia. The surrounding waters are named in the political map accompanying this article.

Lying between 11° S. and 38° S., Australia has seasons the opposite of those in the northern hemisphere. When it is summer in North America the winter season is on in Australia. Wheat harvest is in January.

The People. In 1913 there were in Australia and Tasmania 4,872,059 people, not including the aboriginal, or native, races (see below). Of these, 201,675 were in Tasmania. The inhabitants are largely British or of British descent. The country is so sparsely settled that the average density of population is but 1.67 people to the square mile. The thickly-settled portion is along the eastern and southeastern coast, where are found the great cities of Brisbane, Sydney, Melbourne and Adelaide. On the southwestern Indian Ocean coast is Perth.

The Aborigines. The native races of Australia are called *aborigines,* which means *from the beginning.* They have some characteristics of the black races of Africa, but lack the intelligence of many of the tribes of the "dark continent." Ethnologists are inclined to consider them as a race distinct from all others. These natives are of medium height, are dark in color, and have black hair which is never "kinky," as is that of the negroes; it is either straight or curly.

Their development, physical, mental and

AUSTRALIA
ENGLISH STATUTE MILES
0 50 100 200 300 400 500
KILOMETERS
0 100 200 300 400 500 600 700 800
Same scale as Australia
TASMANIA
HOBART
LAUNCESTON
130 Longitude E East
INDIAN OCEAN
TIMOR SEA
ARAFURA SEA
WESTERN AUSTRALIA
NORTHERN TERRITORY
SOUTH AUSTRALIA
EASTERN GOLDFIELDS DIVISION
MURCHISON DIVISION
GASCOYNE DIVISION
SOUTHWEST DIVISION
EUCLA DIVISION
GREAT AUSTRALIAN BIGHT
Great Sandy Desert
Gibson Desert
Great Victoria Desert
TROPIC OF CAPRICORN
PERTH
Fremantle
Albany
Geraldton
Kalgoorlie
Esperance
Broome
Derby
Kimberley
Darwin
Alice Springs
Ayers Rock
Mt. Olga
Mt. Bruce
Mt. Macpherson
Mt. Bates
Mt. Labouchere
Mt. Margaret
Mt. Sir Thomas
Mt. Stanley
Mt. Liebig
Mt. Cockburn
Mt. Morris
Mt. Hammersley
Mt. Russell
Mt. Murchison
Mt. Shenton
Mt. Leonora
Mt. Barker
Mt. Barren
Mt. Gambier
Mt. Lofty
Mt. Remarkable
Mt. Arapiles
Mt. Gambier
Mt. Schank
Mt. Hope
Mt. Pleasant
Mt. Wedge
Mt. Wilson
Mt. Wood
Mt. Zeehan
Mt. Bischoff
Mt. Cameron
Mt. Direction
Mt. Dromedary
Mt. Dundas
Mt. Elephant
Mt. Field
Mt. Gardner
Mt. Gould
Mt. Grandchester
Mt. Hicks
Mt. Horrocks
Mt. Lyell
Mt. Nicholas
Mt. Norfolk
Mt. Pelion
Mt. Pleasant
Mt. Roland
Mt. Sorell
Mt. Stuart
Mt. Victoria
Mt. Wellington
Mt. William

Gulf of Papua
Torres Strait
Cape York Peninsula
CORAL SEA
PACIFIC OCEAN
QUEENSLAND
NEW SOUTH WALES
VICTORIA
TASMANIA
NEW ZEALAND
Same scale as Australia
NORTH ISLAND
SOUTH ISLAND
Auckland
WELLINGTON
Christchurch
Dunedin
SYDNEY
Newcastle
MELBOURNE
Ballarat
Bendigo
CANBERRA
BRISBANE
Rockhampton
Mackay
Townsville
Cairns
Mt. Isa
Broken Hill
Lyell Mt.
Mt. Kosciusko
Port Albert
Wilson Prom.
Port Phillip Bay
Bass Strait
KING I.
FLINDERS I.
FURNEAUX GROUP
Great Sandy I.
Fraser I.
Moreton I.
Stradbroke I.
Gr. Barrier I.
Mt. Egmont
Mt. Ruapehu
Mt. Cook
Mt. Tasman
Banks Pen.
Foveaux Strait
South C.
SOUTH TRAP
Cook Strait
Port Hardy
Port Chalmers
Bluff
Hokitika
Greymouth
Nelson
Blenheim
Wellington
Napier
New Plymouth
Hawke B.
Poverty B.
Bay of Plenty
East C.
Hauraki G.
Waikato R.
Auckland
Hamilton
Rotorua
Taupo
Gisborne
Hastings
Wanganui
Palmerston
Foxton
Masterton
Carterton
Greytown
Featherston
Wairarapa
Marlborough
Nelson
Westport
Reefton
Greymouth
Hokitika
Kumara
Arahura
Ross
Hokitika
Okarito
Haast
Jackson Bay
Arawata
Jamestown
Wanaka
Lake Wakatipu
Queenstown
Kingston
Lake Wakatipu
Lake Hawea
Wanaka
Lake Wanaka
Lake Dunstan
Cromwell
Alexandra
Clyde
Roxburgh
Lake Roxburgh
Lake Onslow
Lake Manapouri
Lake Te Anau
Lake Monowai
Lake Hauroko
Lake Poteriteri
Lake Wakatipu
Lake Wakatipu
Lake Wakatipu

moral, is very low. In winter they shelter their families in bark dwellings; in summer they wander in bands or tribes. Except in coldest weather, when they wear skins of animals, they live in practically a naked state. The favorite weapon of the natives is the boomerang (which see).

These first people once numbered at least 150,000, but the race is rapidly decreasing; the number now is estimated at 40,000.

Political Divisions. The Commonwealth of Australia, consisting of the six colonies (now denominated Original States) of New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania, was proclaimed at Sydney January 1, 1901. After five of these colonies had, by legislative enactments, approved by the direct vote of the electors, declared their desire for a Federal Union, the British Parliament, on July 9, 1900, passed the act to constitute the Commonwealth. This act provided for the inclusion of Western Australia in the Federation if that colony so desired, and in the following month the colonial legislation necessary for this end was passed.

Surface and Drainage. The relief forms of Australia are much simpler than those of other continents. The elevation consists of a chain of highlands known as the Great Dividing Range, which begins near the western boundary of Victoria and extends nearly parallel to the coast as far as Cape York. These mountains are highest at their southern extremity, where Mount Kosciusko, the highest peak, reaches an elevation of 7,175 feet, and two others exceed 7,000 feet. This mountain system is given various local names, such as the Australian Alps, in Victoria, the New England Range and Liverpool Range. It is distant from the coast from fifty to 300 miles, and forms the watershed which separates the rivers flowing into the Pacific from those flowing into the interior and into the Indian Ocean. The center of the continent is a vast low plain, which rises gradually toward the north and west. In some places this is traversed by low ranges of hills that divide it into smaller plateaus of varying elevations. To the west of this plain, and skirting the western coast, are irregular ranges of low mountains. The northern and southern coasts are nearly all low land.

The rivers are few, and the river systems are very small. The most important of these is the Murray, with its tributaries, the Darling, Lachlan and Murrumbidgee. This system drains a great part of the interior west of the Dividing Range and enters the sea on the south coast. To the east of the Dividing Range the important streams are the Hunter, Clarence, Brisbane, Fitzroy and Burdekin. The Gilbert, Norman and Flinders are the principal streams flowing into the Gulf of Carpentaria; on the western coast the Murchison, Gascoyne, Ashburton and Fitzroy flow into the Indian Ocean. In the interior is a number of streams which flow into salt lakes or evaporate in the sands. The most important of these is Cooper's Creek; the others are all small. There are several lakes in the interior, all of which are on the south side of the continent. They have no outlets and consequently are salt. The most important of these are lakes Eyre, Torrens, Gairdner and Amadeus.

Mineral Resources. The most important mineral yet discovered is gold, and for more than fifty years the output of gold from Australia has been among the largest of all countries. The gold district is along the eastern part of the continent and is almost entirely confined to the region traversed by the mountains. However, since 1890 some valuable mines have been opened near the western coast. There are also valuable deposits of coal and iron ore, as well as mines of silver and copper which yield a profitable income. Antimony, bismuth, manganese, platinum and lead are also found. Diamonds and other precious stones occur in some localities, and building stones of good quality, together with clays suitable for brick and tile, are abundant.

The total average mineral production per year is about £26,000,000, or $130,000,000. Of this, gold is £9,000,000, or $45,000,000; silver and lead, $23,000,000; copper, $15,000,000; coal, $28,000,000.

Climate. The climate of Australia is generally hot and dry, but healthful. In the tropical portions there are heavy rains, and in most of the coast districts there is a sufficiency of moisture, but in the interior the heat and drought are extreme. Considerable portions devoted to pasturage are liable at times to suffer from drought. At Melbourne the mean temperature is about 56°, at Sydney about 63°. The southeastern settled districts are at times subject to excessively hot winds from the interior, which cause great discomfort and are often followed by violent cold winds from the south. In the mountainous

and more temperate parts snow-storms are common in winter (June, July and August).

Vegetation. The Australian flora presents peculiarities which mark it off by itself in a very decided manner. Many of the most striking features have an unmistakable relation to the general dryness of the climate. The trees and bushes have for the most part a scant foliage, presenting little surface for evaporation, or thick leathery leaves well fitted to retain moisture.

The most widely-spread types of Australian vegetation are the various kinds of gum-tree, the shea-oak, the acacia or wattle, the grass-tree, many varieties of other trees and a great number of ferns and tree ferns. Of the gum-tree there are found upward of 150 species, many of which are of great value. Individual specimens of the peppermint have been found to measure from 480 to 500 feet in height. As timber trees, the most valuable member of this genus is the red-gum, the timber of which is hard, dense and almost indestructible. A number of the gum-trees have deciduous bark. The wattle or acacia includes about 300 species, some of them of considerable economic value, yielding good timber or bark for tanning.

The most beautiful and most useful is that known as the golden wattle, which in spring is adorned with rich masses of fragant yellow blossom. Palms—of which there are twenty-four species, all except the cocoa palm peculiar to Australia—are confined to the south and east coasts. Among the so-called "scrubs," thickets of densely inter-twisted bushes occupy extensive areas. The mallee scrub is formed by a species of dwarf eucalyptus, the mulga scrub by a species of thorny acacia. A plant which covers large areas in the arid regions is the spinifex or porcupine grass, a hard, coarse and excessively spiny plant, which renders traveling difficult, wounds the feet of horses and is utterly uneatable by any animal. Australia possesses great numbers of turf-forming grasses, such as the kangaroo-grass, which survives even a tolerably protracted drought. The native fruit trees are few and unimportant, and the same may be said of the plants yielding roots used as food. The vine, the olive and the mulberry thrive well, and quantities of wine are now produced. The cereals of Europe and maize are extensively cultivated, and large tracts of country, particularly Queensland, are under sugar-cane.

Agriculture. One of the remarkable facts regarding Australia was that once it had no bumblebees and could raise no clover. This insect aids in cross-fertilization of plants, and it is the only one that can fertilize clover. Bees were imported in great numbers into the country, and now clover is an important crop.

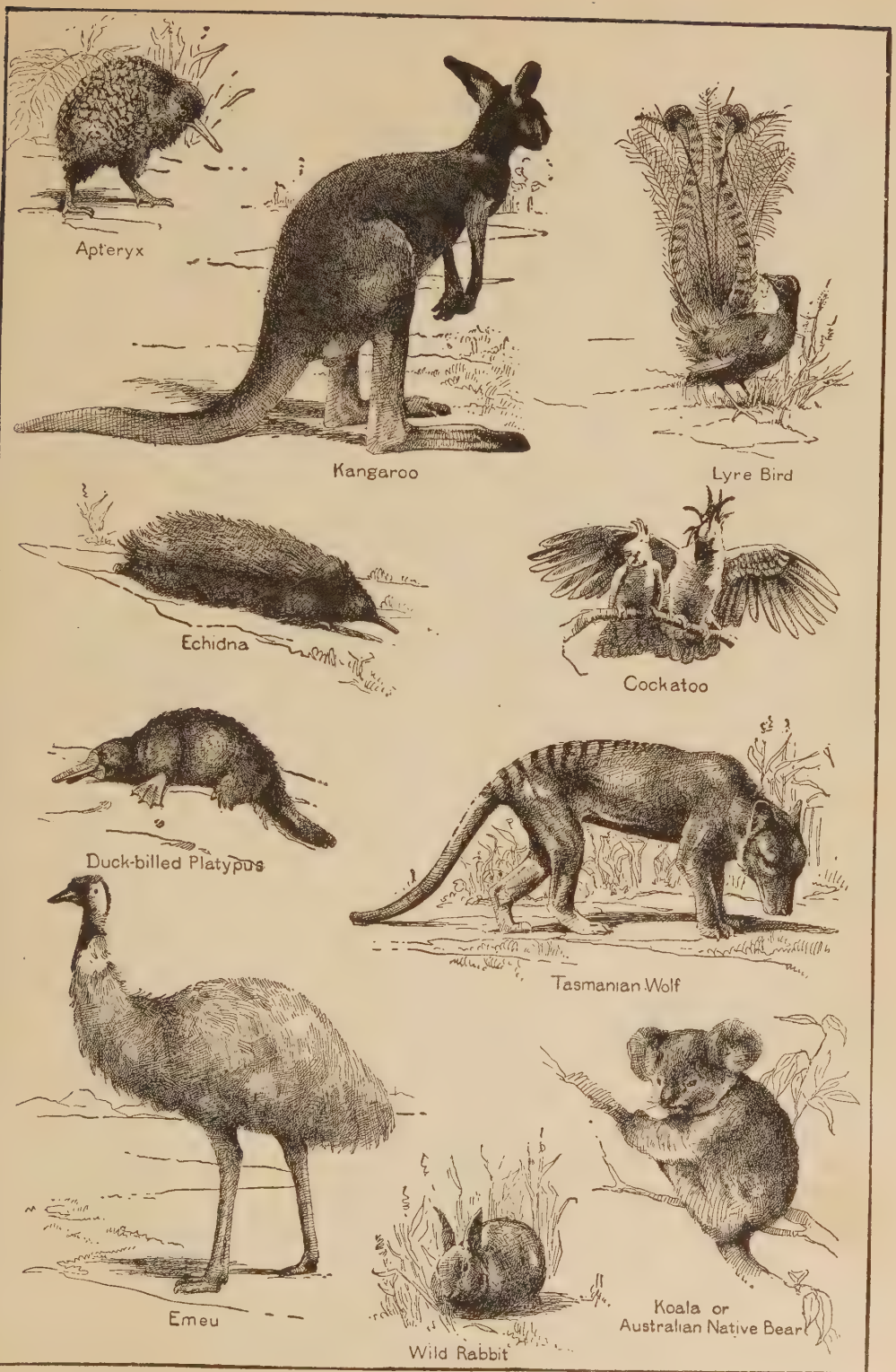
Only about six per cent of the land has yet been brought under production. Had not the World War (1914–1919) so engaged the man power of Australia, a great agricultural advance would have set in. The war, however, decreased production and effectively put an end temporarily to ambitious plans of the various states.

The climate and soil of Australia are adapted to the production of nearly all grains and fruits grown in the warm temperate and semitropical regions, but because of lack of rainfall only a small portion of the country is under cultivation. This is almost wholly confined to the eastern section on both sides of the mountains. The condition of the interior very closely resembles that of certain portions of the great plains and plateaus in the United States, and it is found that this yields to irrigation in a similar manner; consequently, in the western portions of Queensland and New South Wales and in some parts of South Australia, irrigation by means of artesian wells and streams is practiced with great profit.

The entire region, wherever there is sufficient rainfall for grass, is especially adapted to grazing and is one of the most suitable regions in the world for raising sheep; consequently, the number of these animals found in Australia exceeds that in any other country, and Australia is the largest wool-producing country in the world. Cattle are also raised in large numbers in Queensland and some of the other states. By means of refrigeration, mutton and beef can be exported to excellent advantage; consequently, stock-growing is a profitable occupation.

The leading crops are wheat, corn and hay, though but little more of any crop is grown than is required for home consumption. Grapes, coffee, bananas and other fruits are successfully grown, but fruit-raising is not one of the chief industries.

Manufactures. The manufactures are limited and are confined almost entirely to those industries which are connected with the preparation of raw material obtained from


Apteryx
Kangaroo
Lyre Bird
Echidna
Cockatoo
Duck-billed Platypus
Tasmanian Wolf
Emeu
Wild Rabbit
Koala or
Australian Native Bear

the agricultural regions, the preparation of food products, the manufacture of textiles, clothing, iron products and machines. The large income obtained from mining and raising live stock has precluded the establishing of manufactures on any extended scale, since most of the manufactured products can be obtained cheaper from other countries than they can be made at home. The manufactures for all the states of the Commonwealth amount to about $300,000,000 a year.

Transportation. The country is almost entirely devoid of navigable rivers; hence, for inland transportation it must rely on railways and carriage roads. There are about 20,000 miles of railway, including 500 miles in Tasmania. Trunk lines now connect all the important cities and many of the large towns in the four eastern states. Nearly all of these lines are owned and operated by the government. In fact, it was only by government aid that their construction was made possible, since the sparsely settled condition of the country would not warrant sufficient revenue to induce private capital to construct the lines. Telegraph lines connect all the important towns and extend across the continent from north to south and from east to west. These and most of the telephone lines are also owned and operated by the government.

By means of the British Pacific Cable and connection with the American Pacific Cable, as well as by lines connecting with Asiatic ports, Australia has direct telegraphic communication with all countries of the world.

Government. The Commonwealth of Australia is a federation of states, nominally subject to Great Britain, but independent as far as all acts relating to the welfare of the federated states are concerned. The Crown appoints the Governor-General, and the highest court of Great Britain has power to review, under certain limited conditions, the acts of the highest court of the Commonwealth. The federation is based upon a constitution which very closely resembles that of the United States. The legislative power is vested in a Parliament consisting of two branches, a Senate and a House of Representatives, the members of each to be elected by the people of the different states. The Senators are elected for six years and the Representatives for three years. At the organization of the government each state was allowed six members in the Senate, and it was provided that half the number of Senators should retire every three years, but they are eligible for reëlection. The number of members in the House of Representatives is as nearly as possible twice the number of Senators. The Federal Parliament may extend the voting powers of the people, but cannot restrict them. All revenue bills must originate in the House of Representatives, and the course of procedure is similar to that in the Congress of the United States.

The executive department consists of the Governor-General and a Ministry, the members of which are members of the Parliament. In this respect the executive department radically differs from that of the United States. At the head of the judicial departments is a high court of justice, which may hear appeals from all federal courts, from supreme courts of the states and from the interstate commission. This court also has original jurisdiction in difficulties arising from federal laws, in disputes between states and between the citizens of different states. Appeals from the decisions of the high court to the British Privy Council may be taken on questions involving the limits of the constitutional powers of the Commonwealth or of the different states, provided the high court certifies that the question is one which ought to be determined by the Council. All rights are reserved to the states unless they have been specifically delegated to the federal government. In this respect the constitution is like that of the United States and the opposite of that for the Dominion of Canada.

The constitution of Australia is regarded by many students of politics as a step in advance of any constitution that has previously been prepared. In addition to the ordinary functions assumed by the national government, the Australian government assumes control of banking and insurance, marriage, divorce, parental rights and guardianship, naturalization and the control of immigration and of foreign races within the state. It also has control of most of the telegraphs, telephones and railway lines now constructed and has authority to obtain control of others, with the consent of the state through which the lines extend.

Australia has also made great advancement in settling important sociological and governmental problems, such as the conflicts between labor and capital, the construction and maintenance of highways, irrigation, savings banks, the assisting of agriculture by reduced

Camphor

Cinnamon

Mulberry

Clove

Bottle Tree

Pepper

Olive

Kauri Pine

Nutmeg

Eucalyptus

freight rates and transportation of seeds and agricultural instruments, and in times of drought in the transportation of stock. The government has also from time to time appropriated large sums for assisting agriculture in such ways as exterminating injurious insects and animals, advancing loans to farmers, and granting bounties to those farmers who are willing to found new industries, such as the manufacture of dairy products and the introduction of new crops.

History. The date of the discovery of Australia is uncertain, but previous to 1542 the Portuguese published an account of the existence of a land which corresponded to Australia, and they were probably the first Europeans to see the continent. A Portuguese navigator visited Australia in 1601 and five years later the Spaniard Torres passed through the strait that bears his name. Within the next twenty-five years most of the coast line was surveyed by Dutch navigators and in 1664 it was named New Holland by the Dutch government. Australia came into the possession of Great Britain in 1770. The first English settlement was made at Botany Bay in 1788 by some convicts who were transported by the government. These were followed by other colonists, the first settlements all being made along the eastern coast, from the north southward. Following these were expeditions into the interior, though no one succeeded in crossing the mountains until 1813. The discovery of gold in 1851 and 1852 led to extensive immigration, and the development of Australia along all industrial lines dates from that event. The present political divisions were first formed as independent colonies, and then were joined in the federation of the Commonwealth of Australia on January 1, 1901.

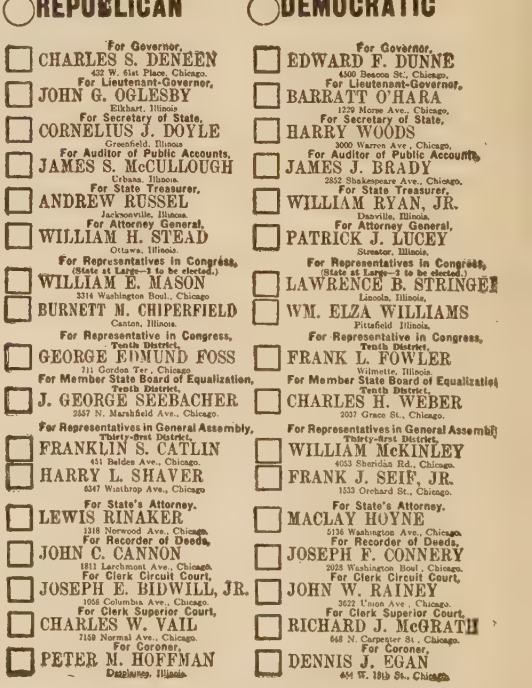
When the Commonwealth was organized, Melbourne was chosen as the temporary capital, but in October, 1900, a site for the permanent capital was selected in the district of Yass-Canberra, New South Wales, Canberra being the name of the new city. Plans were submitted by architects all over the world in competition; the prize was awarded to Walter B. Griffin of Chicago. In 1913 the first stone of the new city was laid by Lord Denham, the Governor-General. In 1914 Australian forces seized Apia, in German Samoa, shortly after the outbreak of the World War.

This was the beginning of whole-hearted participation in the war. Though Australia is thousands of miles from England, and but few Australians have ever visited the "mother country," the British Isles are always referred to as the homeland. When Britain declared war against Germany it did not ask Australia for help; Australia immediately volunteered aid. It raised over 100,000 volunteers, who with New Zealanders, formed the renowned "Anzac" troops—Australian and New Zealand Army Corps.

Related Articles. Consult the following titles for additional information:

Adelaide	Murrumbidgee	Queensland
Ballarat	Newcastle	South Australia
Botany Bay	New South Wales	Sydney
Brisbane	Northern Territory	Tasmania
Hobart	Perth	Victoria
Melbourne		Western Australia
Murray River		

AUSTRA'LIAN BALLOT, a method of voting so called because it was first used in Australia. Its essentials are an official printed ballot, supplied by the state or local author-


REPUBLICAN

For Governor,
CHARLES S. DENEEN
432 W. 61st Place, Chicago.
For Lieutenant-Governor,
JOHN G. OGLESBY
Elkhart, Illinois
For Secretary of State,
CORNELIUS J. DOYLE
Greenfield, Illinois
For Auditor of Public Accounts,
JAMES S. McCULLOUGH
Urbana, Illinois
For State Treasurer,
ANDREW RUSSEL
Jacksonville, Illinois
For Attorney General,
WILLIAM H. STEAD
Ottawa, Illinois
For Representatives in Congress, (State at Large—2 to be elected.)
WILLIAM E. MASON
3314 Washington Boul., Chicago
BURNETT M. CHIPERFIELD
Canton, Illinois
For Representative in Congress, Tenth District,
GEORGE EDMUND FOSS
711 Gordon Ter., Chicago
For Member State Board of Equalization, Tenth District,
J. GEORGE SEEBACHER
2557 N. Marshfield Ave., Chicago
For Representatives in General Assembly, Thirty-first District,
FRANKLIN S. CATLIN
451 Belden Ave., Chicago.
HARRY L. SHAVER
6347 Winthrop Ave., Chicago
For State's Attorney,
LEWIS RINAKER
1318 Norwood Ave., Chicago
For Recorder of Deeds,
JOHN C. CANNON
1811 Larchmont Ave., Chicago
For Clerk Circuit Court,
JOSEPH E. BIDWILL, JR.
1058 Columbus Ave., Chicago.
For Clerk Superior Court,
CHARLES W. VAIL
7159 Normal Ave., Chicago
For Coroner,
PETER M. HOFFMAN
Dunlap, Illinois

DEMOCRATIC

For Governor,
EDWARD F. DUNNE
4900 Beacon St., Chicago.
For Lieutenant-Governor,
BARRATT O'HARA
1729 Morse Ave., Chicago
For Secretary of State,
HARRY WOODS
3000 Warren Ave., Chicago
For Auditor of Public Accounts,
JAMES J. BRADY
2852 Shakespeare Ave., Chicago.
For State Treasurer,
WILLIAM RYAN, JR.
Danville, Illinois
For Attorney General,
PATRICK J. LUCEY
Streator, Illinois
For Representatives in Congress, (State at Large—2 to be elected.)
LAWRENCE B. STRINGER
Lincoln, Illinois
WM. ELZA WILLIAMS
Pittsfield Illinois
For Representative in Congress, Tenth District,
FRANK L. FOWLER
Wilmette, Illinois
For Member State Board of Equalization, Tenth District,
CHARLES H. WEBER
2037 Grace St., Chicago
For Representatives in General Assembly, Thirty-first District,
WILLIAM McKINLEY
4053 Sheridan Rd., Chicago.
FRANK J. SEIF, JR.
1533 Orchard St., Chicago.
For State's Attorney,
MACLAY HOYNE
5136 Washington Ave., Chicago.
For Recorder of Deeds,
JOSEPH F. CONNERY
2023 Washington Boul., Chicago.
For Clerk Circuit Court,
JOHN W. RAINEY
3522 Union Ave., Chicago.
For Clerk Superior Court,
RICHARD J. McGRATH
642 N. Carpenter St., Chicago.
For Coroner,
DENNIS J. EGAN
454 W. 19th St., Chicago.

PART OF A BALLOT USED UNDER THE AUSTRALIAN BALLOT SYSTEM IN THE UNITED STATES

ities, and absolute secrecy. Coercion, intimidation and open bribery are eliminated by the use of the Australian ballot system.

The names of the candidates to be voted for are arranged under the heading of their respective parties and usually in the order of the rank of the office. The ballots are delivered to the judges of election in sealed packages on election morning. Each ballot is marked with the initials of one of the inspectors as a means of preventing the introduction of fraudulent ballots. The voter takes the ballot into a booth, where he may mark it as he pleases. If he wishes to vote a "straight ticket" he may put a cross in the circle at the head of the party column. If he wishes to vote for some candidates of one party and some of another, he puts a cross in the squares before the names of those for whom he wishes to vote; this is called "scratching" or "splitting" a ticket. In another form of the ballot the names of all the candidates are arranged in alphabetical order for each office. The voter, after marking his ballot, must fold it so that none of the marks can be seen and hand it to one of the election officials.

The Australian ballot was first used in the colony of South Australia in 1856; it was introduced into Victoria and several other colonies in the same year. In 1869 the system was given a trial at Manchester, England, and in 1872 it was definitely established by act of Parliament. Shortly afterward it was introduced into Canada, but not until 1888 into the United States. A Wisconsin law of 1887 had some features of the Australian system, but the first complete law was that of Massachusetts in the next year. In 1889, chiefly as a result of an unprecedented amount of bribery in the presidental election of 1888, nine states passed laws modeled on the Australian system, and the system is now used in all the states of the United States.

AUSTRIA, the name of the smaller main division of the former Austro-Hungarian monarchy, and of a new state that was formed in 1918. Old Austria was an empire in title, and with the kingdom of Hungary constituted the loosely-organized state of Austria-Hungary that disintegrated under stress of the World War. The composition, location and government of the old Austrian empire are fully described in the article AUSTRIA-HUNGARY. This article deals with the new state.

In the Austrian empire there were two crownlands—Upper Austria and Lower Austria—which were chiefly German in population, and when the dual monarchy fell to pieces, in the fall of 1918, a "German State of Austria" was proclaimed, with these crownlands as the nucleus. This action was taken on October 23, 1918, by the German-Austrian deputies in the Austrian Reichsrat. In February, 1919, an election to choose representatives to the new national assembly at Vienna was held.

Upper Austria occupies the western part of the original archduchy of Austria (see AUSTRIA-HUNGARY, subhead *History*), and adjoins Germany on the west. It has an area of 4,628 square miles; in 1910 its population was 853,000. It is divided into two unequal parts by the Danube River, which flows from west to east across both crownlands. The land is fertile and productive, and yields good crops of rye, barley, oats, wheat, vegetables and fruit. Stock raising, mining of brown coal and salt, quarrying of gypsum and stone and manufacturing are the chief industries besides agriculture. Lower Austria, occupying the eastern part of the old archduchy, has an area of 7,658 square miles. Its population in 1910 was 3,532,000. It is primarily an industrial district, with the city of Vienna the chief center of manufacture. South of the Danube Lower Austria is a part of the Alps district, and abounds in picturesque mountain lakes, river valleys and mineral springs. The crownland possesses valuable forests, and normally there is considerable trade in lumber and wild game.

Representatives of Austria received treaty terms from the peace conference at Saint Germain, France, on June 2, 1919. The Austrian state, by the terms presented, includes most of the following territory:

PROVINCE	AREA	POPULATION
Lower Austria	7,658	3,532,000
Upper Austria	4,628	853,000
Salzburg	2,763	215,000
Carinthia	3,989	396,000
Styria	8,662	1,444,000
Tyrol and Vorarlburg	11,312	1,092,000
	39,012	7,532,000

The exact boundaries between Austria and Jugo-Slavia and Austria and Czecho-Slovakia were left to the determination of commissions; part of Styria was to be included in Jugo-Slavia, and certain areas in Carinthia were to have their status determined by a plebiscite. Austria was required to recognize the independence of Jugo-Slavia and Czecho-Slovakia, and to grant full protection to all nationalities within its jurisdiction.

Peasants in Sabbath garb

AUSTRIA-HUNGARY, or **AUSTRO-HUNGARIAN MONARCHY,** until the latter part of 1918 the second largest country of Europe, a dual monarchy consisting of the empire of Austria and the kingdom of Hungary. It was a confederation of states held together by the helplessness of some of them, by political expediency in the case of others, and by virtual dictation of the great powers of Europe in a few instances. As the World War neared its close the disintegration of the dual monarchy, long expected by political observers, became a reality, and Austria-Hungary broke up into various elements.

Why Austria-Hungary Existed. It has been pointed out by statesmen that had there been no Austria-Hungary it would have been necessary to create one, for such a government as it possessed and such allegiance as it forced upon its peoples seemed the only means by which diverse and antagonistic races could be held together.

The inhabitants represented so many nationalities that the country was frequently referred to as the "crazy-quilt of Europe." The government gave official recognition to eleven different nationalities; on the monetary unit of Austro-Hungarian currency—the krone—the value of the coin was printed in all the eleven languages. The question, "How can a monarchy so constituted endure?" continually perplexed the statesmen of the continent. It was generally believed that the emperor-king, Francis Joseph, would be able to hold the elements together, but many prophecies were made as to the fate of the country after his death. Francis Joseph lived half through the great war which he had helped to start; at his death in 1916 his nephew Charles I (Karl) ascended the throne, and the stress of war bore so heavily upon the dual state that for a time all of the new emperor's energies were directed toward its prosecution. He was, however, unable to hold the states together or to save his crown. The Austro-Hungarian forces were decisively defeated on the Italian front in October, 1918, and on November 1 armistice terms were presented to the Austrian government by the allies. On November 12 the abdication of Charles was announced, though it was afterwards stated that the complete formalities had not been complied with. For further details, see subhead *History,* below.

Location of Old Austria-Hungary. The dual monarchy was located between Saxony, Prussia and Russia on the north, and Rumania, Serbia and Montenegro on the south; Switzerland and Bavaria were on the west, and Russia and Rumania on the east. Along the southwestern boundary were Italy and the Adriatic Sea.

Its States and Their Area. The two largest divisions of the monarchy were the Austrian empire and the Hungarian kingdom. Bosnia and Herzegovina, formerly possessions of Turkey, were an integral part of the monarchy after 1908. Austria-Hungary as a whole had an area of 261,241 square miles; if the area of Connecticut, the third smallest state of the American Union, were added to it, the whole would be about the size of Texas. The Austrian empire, which spread about the Hungarian kingdom in the form of an arc, was 115,832 square miles in area, or slightly larger than the state of Arizona. The Hungarian kingdom covered 125,641 square miles, and Bosnia and Herzegovina together, 19,768 square miles. The Austrian empire was composed of the seventeen crownlands of Bohemia, the Bukowina, Carinthia, Carniola, Dalmatia, Galicia, Görz and Gradisca, Istria, Lower Austria, Moravia, Salzburg, Silesia, Styria, Tyrol, Triest, Upper Austria and Vorarlberg. Hungary proper and the crownland of Croatia and Slavonia comprised the Hungarian kingdom.

The People. The table (page 297) shows the different races that formed this polyglot state. In Austria the dominant race was German in language and sympathies, while the Magyar-speaking people were the ruling class in Hungary. Together they formed about forty-four per cent of the entire population. Only the German-speaking element and the Magyars willingly supported the central powers in the World War (see *History,* below).

The Roman Catholic religion was the faith of by far the greatest number of people; other religious bodies included the Greek and Armenian Catholics, Evangelicals, members

of the Eastern or (Orthodox) Church, Jews and Moslems.

THE MONARCHY AS A WHOLE

Language	Population	Per cent
German	12,010,669	23.39
Magyar	10,067,992	19.60
Bohemian, Moravian, Slovak	8,475,292	16.50
Slovak	.....	.....
Polish	5,019,496	9.77
Ruthenian	3,998,872	7.79
Serbian and Croatian	5,545,531	10.79
Rumanian	3,224,755	6.28
Slovene	1,349,222	2.63
Italian and Ladin	804,271	1.57
Other	860,365	1.68
Total	51,356,465	100.00

The civil population of Bosnia and the Herzegovina is included in the foregoing table under "Monarchy as a Whole." The principal linguistic element in this population is Croatian and Serbian, being represented by 1,822,564 persons.

Education. Children in all parts of the monarchy were compelled to attend the free elementary schools. The dominating language in any community was used in the schools of that district. High-school education in Austria was provided by the *realschulen* and gymnasia. The former prepared students for technological institutes, and the gymnasia prepared them for the universities. In 1916 there were 44,220 students in the *realschulen* and 84,907 in the gymnasia. There were seven government technical high schools in Austria, and eight government-controlled universities (see VIENNA, UNIVERSITY OF). Hungary supported numerous normal schools, gymnasia, *realschulen*, higher schools for girls, universities and technical schools. At the outbreak of the World War there were over 7,000 students in attendance at the University of Budapest.

General Description. The surface, drainage, minerals, industries, etc., of the old dual monarchy are reserved as parts of the stories of the new states that have been built upon the ruins of the former government. (See list of related articles at close of this article.)

Government. The Austro-Hungarian Monarchy consisted of two separate governments, whose only bond of union, practically, was the ruler who was at once emperor of Austria and king of Hungary. All matters affecting the joint interests of the two divisions of the monarchy, such as foreign affairs, war and finance, were dealt with by a body consisting of two Delegations, one chosen by the Austrian diet and one by the Hungarian diet. These two Delegations met alternately at Vienna and Budapest, and deliberated separately, meeting in common only when unable to agree after three communications with each other.

Austria, independent of Hungary, had a government of its own. The emperor was the source of law and justice. He not only legislated concurrently with the *Reichsrat* and with the provincial diets, but made treaties, issued decrees, granted pardons and summoned and dissolved the legislatures; but every act of his had to be countersigned by a Minister, who was thus held responsible to Parliament. This *Reichsrat* consisted of two houses, the House of Lords (*Herrenhaus*) and the House of Representatives (*Abgeordnetenhaus*).

The executive branch of the government was managed by eight departments, each with a Minister, together with two Ministers who had no special duties. Local government was carried on through the provinces, each of which had a diet, consisting of one house, and an executive, consisting of a committee, with a president appointed by the emperor and a number of members elected by the diet. Every province was also a *department*, which was administered by a governor appointed by the emperor. A department was divided into *districts* and *communes*. The system of courts included district courts, higher circuit courts, provincial courts and the Supreme Court of Justice and Cassation at Vienna, besides other courts having special jurisdictions.

The government of the kingdom of Hungary was in form similar to that of Austria, but the king played a less important part than in Austria. The Parliament was composed of two houses, the Table of Magnates and the House of Representatives, the members of the upper house consisting of certain representatives of the royalty, the nobility and the Church and other peers nominated by the Crown; the lower house, of representatives elected by the people with a fairly general franchise. The executive power was vested in a Cabinet consisting of nine Ministers, each ruling a department, and a Minister President. It was responsible to the Parliament. For purposes of local government, Hungary was divided into sixty-three counties, at the head of each of which was a governor. Within the counties were *incorporated towns*, which were governed by magistrates and *presidencies*. The latter in

turn were divided into greater and smaller *communes,* over each of which was a legislative body, half appointed and half elected. The presidencies were only administrative units. The system of courts was in general similar to that of Austria.

History. *In the Middle Ages.* In 796 Charlemagne drove the Avars from the territory between the Enns and the Raab and united it to his empire as a margravate, and from the establishment of this margravate the present Austro-Hungarian Monarchy took its rise. In 900 the Hungarians descended upon the country and gained possession of it, but half a century later they were driven out by Otho I and the province was

LANGUAGE	AUSTRIA		HUNGARY PROPER		CROATIA AND SLAVONIA	
	POPULATION	PER CENT	POPULATION	PER CENT	POPULATION	PER CENT
German	9,950,266	35.58	1,903,357	10.40	134,078	5.10
Magyar	10,974	0.04	9,944,627	54.50	105,948	4.10
Bohemian, Moravian, Slovak	6,435,983	23.02	.....	.....	.....	.....
Slovak	.....	.....	1,946,357	10.70	21,613	0.80
Polish	4,967,984	17.77	.....	.....	.....	.....
Ruthenian	3,518,854	12.58	464,270	2.50	8,307	0.30
Serbian and Croatian	783,334	2.80	656,324	3.60	2,283,809	87.10
Rumanian	275,150	0.98	2,948,186	16.10	846	.....
Slovene	1,252,940	4.48	.....	.....	.....	.....
Italian and Ladin	768,422	2.75	.....	.....	.....	.....
Other	*608,062	.....	401,412	2.20	67,353	.....
Total	28,571,969	100.00	18,264,533	100.00	2,621,954	100.00

*Including foreigners.

reunited to the German Empire. From 982 to 1156 the margravate was hereditary in the dynasty of the Babenbergs, and it was during this time that the name *Oesterreich* (eastern country), from which is derived the name Austria, was given to the country. In 1156 the territory west of the Enns was annexed to Austria, and the whole was made a duchy. From this time on there were various accessions of territory, and the rulers of Austria increased their power until in 1282 Ottokar, one of the strongest of the dukes, ventured to resist the authority of the emperor, Rudolph of Hapsburg. Ottokar was killed in the struggle, and in 1282 Rudolph assigned the territory to his own sons, Albert and Rudolph.

Under the Hapsburgs. From that time until 1918 the family of Hapsburgs ruled in Austria. During the two centuries that followed, the country was constantly disturbed by wars, either with rebellious subjects or with neighboring provinces, but the duchy grew constantly in extent and in its influence in Germany. On the death of his father-in-law in 1438, Albert V, son-in-law of the Emperor Sigismund, became king of Bohemia and Hungary and was also chosen emperor as Albert II. So great had the power of the Austrian house become in Germany, that from this time on the Hapsburgs were able almost always to secure the imperial dignity for themselves.

In 1453, under Frederick III, Austria became an archduchy, and by the marriage of Frederick's son Maximilian to Mary, daughter of Charles the Bold of Burgundy, the Netherlands were annexed to the Austrian possessions. Maximilian, when he became emperor on the death of his father in 1493, transferred the government of the Netherlands to his son Philip, who by his marriage with Joanna of Spain secured possession of the Spanish throne for the Hapsburgs. Philip died before Maximilian, and Charles I of Spain, the son of Philip, succeeded Maximilian as emperor in 1519. He abdicated the imperial throne in 1556 and his brother, Ferdinand I, succeeded him. Ferdinand, by his marriage with the sister of the king of Hungary and Bohemia, had succeeded to the rule of those countries; but a rival king had been elected in Hungary, and it was only after a long struggle that Ferdinand's hold on a part of Hungary was confirmed. When Ferdinand died in 1564, his son Maximilian II succeeded him as ruler of Austria and as king of Hungary and Bohemia, and he on his death was succeeded by his son, Rudolf II. Matthias, the brother of Rudolf, attained the imperial dignity in 1612 and he had his cousin, Ferdinand of Styria, made king of Bohemia and Hungary. The refusal of the Bohemians to accept as their king the Catholic Ferdinand brought on the Thirty Years' War, in which Austria represented through-

out the interests of the Catholics (see THIRTY YEARS' WAR).

Leopold I, the grandson of Ferdinand, who came to the throne in 1657, proved to be a most despotic ruler, and under his tyranny Hungary revolted. With the aid of the Turks, this revolt bade fair to be successful, and the Turks had actually advanced to Vienna and begun a siege, when John Sobieski came to the aid of the city and defeated the besieging army. Leopold was able by 1687 to compel the Hungarians to recognize their country as part of the hereditary possessions of Austria. It was during the reign of Leopold that the question as to the succession to the Spanish throne arose, culminating in the War of the Spanish Succession (see SUCCESSION WARS, subhead *War of the Spanish Succession*). Joseph I succeeded to the imperial throne during this war and, dying before its close, was followed by Charles VI. By the Peace of Utrecht in 1713 Austria came into possession of the Spanish Netherlands, Milan, Naples and Sardinia, but some years later, after the War of the Polish Succession, lost much of this territory.

Charles VI had no sons, but by the Pragmatic Sanction he attempted to secure the throne to his daughter, Maria Theresa. The attempts of the other powers to curtail the possessions of Maria Theresa after her accession to the throne, resulted in the War of the Austrian succession (see CHARLES VI; MARIA THERESA; SUCCESSION WARS, subhead *War of the Austrian Succession*). During the War of the Austrian Succession, the Emperor Charles VII died, and Francis, the husband of Maria Theresa, was chosen emperor as Francis I. The Seven Years' War, into which Austria was plunged for the sake of regaining Silesia, brought no advantages (see SEVEN YEARS' WAR). When Francis I died in 1765, his son, Joseph II, was made joint ruler with his mother. His reign was largely taken up with attempted reforms, which, however, met with determined resistance throughout his dominions and were the cause of revolts.

Leopold II succeeded Joseph, and he was on the throne when the French Revolution broke out. He died before his plans for a resistance to the radical republicanism in France could be fully matured, but his son, Francis, who came to the throne in 1792, carried out his father's projects. In the war with France in Italy, Austria lost some of her Italian possessions, but gained Venice. In 1804 Francis took the title of *Hereditary Emperor of Austria,* and two years later, on the founding of the Confederation of the Rhine, he renounced the title of *Holy Roman Emperor.* Austria suffered much in the Napoleonic campaign of 1809, but in the following year, through the marriage of Napoleon with Maria Louisa, daughter of Francis, was won to an alliance with Napoleon. This lasted but a short time, and Austria had a part in all of the last campaigns against France, and received at the settlement in the Congress of Vienna much of its old territory which had been taken by Napoleon.

From 1815 to 1848 Austria, although it no longer could claim the nominal authority which had been the country's as head of the Holy Roman Empire, exercised a strong influence in Germany as president of the German Diet, and was largely concerned in all the movements of Europe through the policy of Metternich and the Holy Alliance (see METTERNICH, Clemens Wenzel). Its policy was consistently reactionary, and it steadily combated all tendencies towards national feeling in Germany. In 1848, however, when the revolutionary spirit was rife in Europe, Austria found itself called on to subdue revolts on every side. A popular uprising took place in Vienna; Metternich was forced to resign, and the government was compelled to admit a free press and the right of citizens to bear arms. In Italy, too, occurred revolts, and the Austrians were driven out of Venice, where their rule had long been felt to be unendurably irksome.

The most serious difficulty, however, was found in Hungary, where the rebellion was put down only after the abdication of Emperor Ferdinand in favor of his nephew, Francis Joseph, and the formation of an alliance with Russia. A more vigorous policy was now pursued, and the movement in Venice was crushed in 1849. The emperor found himself obliged to proclaim a constitution in Austria, but he was strong enough to make it a constitution of his own formation, with little of the liberal character which had been demanded in the risings of the year before.

Under Francis Joseph. Austria's next move of great and lasting importance was the attempt to suppress the growing national feeling in Italy. Especially were these efforts

directed against Sardinia, which was prepared to resort to arms to drive Austria out of Italy. Sardinia, however, gained the alliance of France, and, by its victories at Magenta and Solferino, obliged Austria to give up its hold on Lombardy. In 1866 occurred another crisis in the affairs of the empire. Bismarck had drawn Austria into the struggle with Denmark for the possession of Schleswig and Holstein, and after the successful outcome of this conflict, the possession of the two duchies was the occasion of war between Austria and Prussia (see SEVEN WEEKS' WAR). The defeat of Austria in this struggle resulted in its entire loss of influence in Germany. Robbed of its position of importance as head of the German Confederation, Austria found that to maintain its integrity it must make concessions in its internal government. The Hungarians, whose demands for a greater degree of self-government never entirely ceased, finally succeeded in forcing from Austria the *Ausgleich* of 1867, an agreement which settled the relations of Austria and Hungary on the basis described above. The political history of Austria-Hungary was chiefly a struggle between the various race elements for the ascendancy, the subjects of dispute being language, religion, education and the forms of government.

In foreign affairs, Austria-Hungary was one of the lesser powers. In 1878 it was authorized by the Congress of Berlin to assume a protectorate over Bosnia and Herzogovina, and in 1908 formally annexed these provinces. In 1883 Austria became a member of the Triple Alliance, with Italy and Germany. During the Balkan War of 1913, Austrian influence was strong, and at the close, Austria's determination that Serbia should get but slight additions of territory resulted in the establishment of the kingdom of Albania, thus creating a new small country instead of giving Serbia an outlet on the Adriatic.

The World War. The Austrian attitude toward the Balkan nations caused constant irritation, especially in Serbia, whose people are allied by ties of blood and religion to the inhabitants of Bosnia and Herzogovina. The anti-Austrian agitations culminated on June 28, 1914, in the assassination of Franz Ferdinand, nephew of Francis Joseph I and heir to the Austrian throne, while he was on a visit to Serajevo, the capital of Bosnia. The assassin was a Serbian student, and the attack was claimed by Austria to have been the result of a widespread Serbian conspiracy. The Austrian government, asserting that high officials of Serbia were involved in the conspiracy, demanded on July 23 that the Serbian government apologize officially for the anti-Austrian agitation, curb the hostile expressions of the press, and allow Austria to make an independent investigation of the supposed conspiracy. To all of these demands, except the last, Serbia yielded, but asked that this demand be referred to the court of arbitration at The Hague. Austria-Hungary promptly declined this offer and declared war against Serbia on July 28.

The momentous events that followed Austria-Hungary's declaration of war, and the outbreak of the great European struggle that eventually became a world conflict, are described in these volumes in the article WORLD WAR. Austria-Hungary's part in that struggle is also described therein. Certain special phases of the war, however as they pertain to Austria-Hungary, should be mentioned here. From time to time reports were current that economic conditions in the dual monarchy were becoming intolerable, that rioting and mutiny were prevalent, and that large numbers of the people were on the side of the Entente. These reports became more and more frequent after the United States entered the war. It is known that early in 1918 an epidemic of strikes spread throughout the country, indicating widespread dissatisfaction.

A sensation was caused in April, 1918, by the announcement of Count Czernin, Austrian Minister of Foreign Affairs, that Premier Clemenceau of France had initiated a peace parley with Austria-Hungary. A prompt denial from the French Premier followed, and during the ensuing controversy the French government published a letter written in 1917 by Emperor Charles, who had succeeded Francis Joseph in 1916. This letter, which was addressed to Prince Sixtus, brother-in-law of the emperor, had been communicated to the French government by the prince himself. In it the emperor signified his desire for peace, his belief in the justice of French claims to Alsace-Lorraine and his favorable attitude toward the reëstablishment of Belgium and Serbia. On the publication of this letter Count Czernin

resigned and was succeeded by Baron Burian. The Austrian press denounced the letter as a partial forgery, but its publication was the signal for sarcastic and hostile comment in Germany.

The spring of 1918 saw conditions in the dual monarchy more turbulent than ever. Extreme shortage in food supplies and the rebellious attitude of the Slavic parties forced the emperor in May to adjourn the Austrian Parliament and to inaugurate autocratic measures to suppress its activities. Dispatches indicated that Czech leaders had joined the Italian colors and that their kinsmen in Magyar-German regiments were openly hostile to the Magyars. In April a convention of Bohemians, Slavs, Jugo-Slavs, Rumanians, Serbs, Italians and Poles met in Rome. This convention, the first assemblage of representatives of the nationalties opposed to Austrian dominion, adopted resolutions in opposition to both Austria-Hungary and Germany.

Great dissatisfaction was aroused, too, by the announcement of a treaty made between William II of Germany and Charles I of Austria, whereby Austria became virtually a vassal state of Germany. One of the most significant provisions was the agreement to unite, for a period of twenty-five years, the military forces of the two states, creating virtually one great army under Germany's control. All of these factors, combined with the gradual decline of the military power of the central empires throughout the summer and fall of 1918, led inevitably to the dissolution of the dual monarchy. Various divisions declared their independence in October and November, and Austria-Hungary ceased to exist.

Divisions of the Former State. The nucleus of the old Austrian empire was the so-called German Austria, made up principally of the crownlands of Upper Austria and Lower Austria. On October 23, 1918, the German-Austrian deputies in the Austrian Reichsrat issued a declaration announcing the creation of the "German State of Austria." Elections for deputies to sit in a new national assembly were held in February, 1919. (For the boundaries of Austria as determined by the peace conference, see AUSTRIA).

The old kingdom of Hungary (with the exception of Croatia and Slavonia), was proclaimed a republic on November 16, 1918, by the Hungarian National Council and the two chambers of Parliament, with Count Michael Karolyi as President. Later a communistic government was established under the leadership of Bela Kun.

A declaration of the independence of the Czecho-Slovak Republic, dated October 18, 1918, was issued at Paris by the provisional government of the new state on October 19. This state, according to tentative plans, was to embrace the former Austrian crownlands of Bohemia, Moravia and Silesia, and the section of Northern Hungary known as Slovakia. The new republic was officially recognized by Great Britain, France and the United States. Its capital is Prague; its first President, Thomas G. Masáryk.

The kingdom of Jugo-Slavia is the fourth division of the old monarchy. *Jugo* means *southern,* and the new state represents, in a general sense, a union of the Slavs of Southern Austria-Hungary and the Slavs of Serbia and Montenegro. The exact boundaries of Jugo-Slavia were left to the determination of the Peace Conference, as the claims of the new state conflicted in various ways with those of Italy. On October 5, 1918, a central executive committee was elected by the national council of Slovenes, Croatians and Serbians, with headquarters at Agram, the capital of Croatia and Slavonia. The committee declared for the creation of a sovereign state on a democratic basis on October 23, and on November 26 the national council appointed Prince Alexander of Serbia regent of the state. The Jugo-Slavs asked to have the following territories incorporated in their kingdom: Serbia, Montenegro, Bosnia and Herzegovina, Croatia and Slavonia, Dalmatia, Carniola, Istria, Triest, Gorizia, and parts of Southern Styria and Carinthia.

The new boundaries of Poland and Rumania also included portions of the old monarchy.

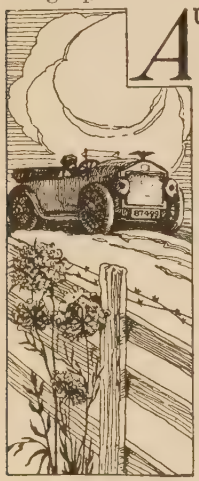
Related Articles. Consult the following titles for additional information:

Austria	Hungary
Balkan Wars	Jugo-Slavia
Bohemia	Magyars
Bosnia	Masáryk, Thomas G.
Bukowina	Moravia
Charles I	Poland
Croatia and Slavonia	Rumania
Czech	Triest
Czecho-Slovak Republic	Triple Alliance
Dalmatia	Tyrol
Galicia	World War

AUTOCRAT OF THE BREAKFAST TABLE, the title of a series of prose sketches by Oliver Wendell Holmes, first published in

1857–1858 in the *Atlantic Monthly*. In them the author impersonates the chief talker, or "Autocrat," at a Boston boarding-house breakfast table. Other characters include the Schoolmistress and the Old Gentleman Opposite. By many competent critics, these sketches, with their genial humor and shrewd philosophizing on life, are considered the best literary efforts of the author. They rank high in American literature.

AUTOGRAPH, *aw'to graf*, a word meaning *writing in one's own hand*, derived from the Greek. A person's signature or a manuscript in his own handwriting is his autograph. The autographs of famous people are very valuable; a complete letter written by Washington or Lincoln, for instance, is worth several hundred dollars; one written by Columbus would be priceless. At the present time eminent people often sell their autographs for the benefit of charity.

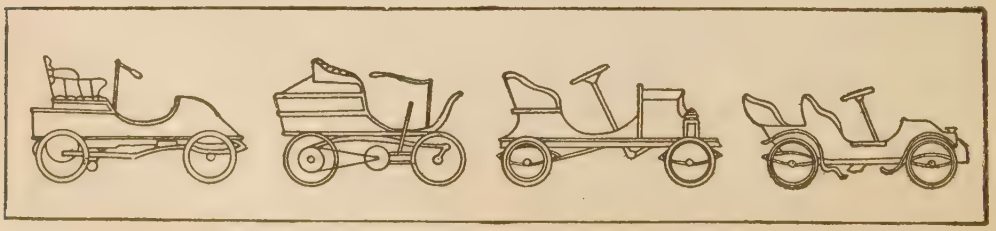


AUTOMOBILE, *aw toh mo'bil*, or *aw toh mo beel'*, the name applied in America to all self-propelling vehicles except tractors, traction engines and railway locomotives, whether the motive power is gasoline, steam or electricity. In England the popular name is *motor car;* the word *automobile* being a French adjective meaning *self-moving*, the British have never used it; Americans are gradually shortening the name to the English form or to the word *motor* or *car*, alone.

Extent of the Motor Industry. The making of automobiles was unknown in the United States until about 1895, although a few experimenters had completed unsatisfactory earlier models. In 1916 it had become the third industry in strength in the United States, exceeded only by iron and cotton in their manufactured forms.

The American pioneer in a commercial sense was Elwood Haynes, who in 1894 made a car which attracted wide attention; it was no more than a crude horseless carriage. Contemporaneous efforts were those of Duryea, Winton, Stearns, Olds and Ford. In the year 1905—ten years after the first cars were offered for sale—the number of cars turned out in American factories was 33,896. These would travel, if they did not "die" on the road, from twenty to thirty miles per hour on smooth roads, but for long journeys they were not sufficiently dependable. Not until 1909 did annual production reach 100,000—it went that year to 125,593; in 1910 over 50,000 more were made. The increase was greater every year thereafter until production was decreased by necessities growing out of the World War, for by 1918 steel and other products were more sorely needed in industries connected with the war. In 1914 the number of cars made was 515,000; in 1915, 842,000; in 1916, 1,303,400; in 1917, 4,242,000, including trucks. Of these 445,000 were in New York state, over 350,000 in Ohio, and 348,000 in Illinois. These three states led in the number owned. Even in Nevada, thinly-populated and with few roads, there were 7,000 cars.

In 1918 there were 433 automobile factories in the United States. In but few of them were all of the parts of their cars fully manufactured. Many factories buy the parts of a car and their employes assemble them. Michigan led the list of states with eighty-three factories; Ohio had sixty-four; Illinois, fifty-two. More motor cars are manufactured within ten miles of the Detroit (Mich.) city hall than in any other like area in the world. In 1917 there was capital to the amount of $800,000,000 invested in motor car plants and production in the United States. The number of men



WHEN MOTOR CARS WERE IN THEIR INFANCY

employed in the industry was more than 80,000.

Iowa leads all the states in the number of cars owned in proportion to population; in 1918 there was one Iowa car to every eight persons. Kansas followed close.

The value, at the retail price, of the cars in the United States in 1918 was over $800,000,000. The forty-eight states of the American Union possessed seventy-seven per cent of the world's automobiles in 1916, after two years of the World War. The percentage since then has very largely increased, but accurate figures are lacking, owing to difficulty in securing European data. Since 1915 nearly all of Europe's energy in this business has been devoted to the manufacture of cars and motor trucks for war purposes. Pleasure cars could not be purchased in Europe after 1916. Many thousands of cars were sent to the war zones from the United States.

Main Parts of an Automobile. There are two chief parts of a car, the *body* and the *chassis* (pronounced *sha'se—a,* as in *ask*). The latter is a French word borrowed from the military, where it means the stationary part, or foundation, on which a big gun rests. An automobile chassis comprises the iron frame, wheels, springs, motor and power transmission parts—everything essential to the movement of the car. Given a soap box for the driver's seat, the chassis can be run upon the road. The body and all other accessories found on cars provide merely accommodations and comforts for passengers or for space for goods to be carried. Any manufacturer is able to build upon his standard chassis any body style that pleases his fancy. He may put upon the chassis a box-like structure for delivery of heavy goods or may build a single-seat body for two or three persons, or for four, five or seven persons, heavily upholstered and equipped with every possible device for the comfort of passengers.

Styles of Passenger Vehicles. For over a dozen years after their introduction only pleasure cars were made. They were crude affairs compared with the perfect machines of the present day, and were single seated, with bodies much like a carriage body. Gradually the bodies were lengthened and the two-seated *touring car* type was developed. Such a car accommodates five people. With a still further lengthening of the body there was room for two additional seats which would fold into the body when not in use.

The enlarged body was given the name *tonneau;* it seemed inappropriate, for the word is French for *hogshead.* There was in the curve of the body the dim suggestion of a barrel, hence the name, and no other has ever been adopted. From the ill-shaped early forms there was gradually evolved the *stream-line* body, so called because from back to front there was a gradual decrease in width; this offered less resistance to wind and gave the appearance of added length. Since 1912 the main efforts of automobile designers has been directed towards such slight changes in bodies as would add to the beauty of the car, and to development of engines, or motors, to the point of reliability.

The automobile with a single seat, built on the same chassis that is used for a touring car, is called a *roadster,* or *runabout.* The rear space which in the touring car is devoted to a seat for passengers, is adapted to storage purposes.

Three Power Types. The great majority of automobiles are driven by gasoline, employed in an internal combustion engine (see GAS ENGINE). These are adapted to touring country roads as well as to city streets, and their speed possibilities vary from thirty to seventy miles an hour. Next in popularity are electric motors (see subhead, *The Electric Car,* below). The third class of cars are those which are driven by steam. Only two or three factories produce these, for they have not made a strong appeal to the public.

THE DEVELOPMENT OF TWENTY YEARS

The Gasoline Motor. This is an internal combustion engine, perfected from large and heavy models which have for years been employed in running small power plants in factories and printing offices. A motor capable of developing thirty-five horse power need now be not over two feet long, about a foot high and even less in width.

In a gas engine the gasoline is forced through a carburetor (which see), where it is vaporized by being mixed with air. The vapor, highly explosive, is drawn into the cylinder by the suction of the piston, and the action of the cylinder compresses it. At the moment of greatest compression the gas is ignited by an electric spark brought to the motor through a spark plug adjusted above the cylinder. Expansion of the gas through ignition drives back the piston, the piston transmits power to the crank shaft, which in turn sends the power onward to the mechanism which turns the wheels.

The earliest motors had only one cylinder. These developed little power, for between explosions the interval was so long that continuous power was impossible. The two-cylinder engine soon appeared, but it, too, was unsatisfactory, for the same reason. When the four-cylinder motor was developed it was thought that perfection was almost attained, but there was still lacking continuous power. Between explosions there were yet short but perceptible intervals of "idling" —when no power was exerted. Eventually a six-cylinder motor appeared. It offered continuous power, but was received skeptically, for it was believed to be too complicated to remain effective. However, such fears were dissipated as the mechanism was perfected, and to-day the six-cylinder motor is the most popular with nearly all classes of people. In 1918 fifty-two per cent of all pleasure cars were equipped with six-cylinder motors.

In 1914 eight-cylinder engines were placed on the market, and in the following year a few manufacturers offered twelve-cylinder cars.

The Electric Car. Thomas A. Edison made possible the electric automobile by the development of a small and powerful storage battery. Whereas the gas and steam cars generate their own power, the electric car is moved with power generated elsewhere and stored in it periodically. The motive power is the storage battery, which must be frequently recharged. It therefore follows that such cars cannot be used except where electric energy is easily available, so they are limited in use to city streets. The power in such a car is much less than in gas and steam cars, and hill climbing is impossible. The distance it can travel with a single charging of the battery varies from seventy to ninety miles, and its speed does not exceed twenty miles an hour. It runs very quietly, is cleaner than a gas car and is more easily controlled.

The Average Gas Car. While there are hundreds of different makes of cars, the purchasing public has shown greatest favor for between thirty and forty, and has bought these in astonishing numbers. Only a few of scores of other models have made successful appeals; in some cases this is due to very high price, in others to popularly-supposed defects or to inferior design, and in other cases to lack of funds properly to introduce cars to the purchasing public.

The average car acceptable to the public in 1919 had a wheel-base of 116 to 120 inches—distance between points of contact of front and rear wheels with the ground; a six-cylinder motor; five passenger body; 34x4-inch tires, and 35 to 40 indicated horse power (which see).

The Automobile in Business. Not until motor cars had reached the point where their motors were dependable did the business world accept them. Gradually they superseded horse power for teaming, and were found to be economical, even though the initial cost of a large truck was considerable. One driver can haul three tons of goods along city streets at the rate of fifteen miles an hour at a cost of a gallon of gasoline for every eight to twelve miles; horse power is possibly a third as speedy in like conditions, and a team cannot draw nearly as heavy a load.

The Automobile in War. The World War, which began in 1914, demonstrated within the first month the supreme value of the motor car in the stress of battle. In the first battle of the Marne 60,000 French troops were dispatched on motors to the fighting front in a single night with such speed that they were able to turn defeat into victory at a critical point. From the touring cars of commanding officers through all classes of machines—hospital ambulances, munition trucks, supply trains, gun

carriages—to the great armored tanks, weighing more than a dozen tons, automobiles were found to be a supremely important arm of the service.

Under stress that horses or mules could not endure motors supplied the front lines of armies with every needful thing with such speed that in scores of instances successful ventures at arms were assured which otherwise would have failed. Motor cars have saved thousands of lives because of the speed with which desperately wounded men were carried to hospitals far in the rear of the fighting line.

Within a few days of the outbreak of the war more than 200,000 motors were engaged; the number soon reached close to a million.

Imports and Exports of Motor Cars. Previous to 1912 the majority of expensive cars sold in the United States were imported from France, where the science of motor building had up to that time reached a higher development than in any other country. Since then American cars have been perfected to the point where they equal or excel those of foreign manufacture. Imports of motor cars into the United States reached their high mark in 1914, with a value of $2,000,000. The World War created a vast demand for American cars for the allied armies, resulting in exports of cars valued at over $150,000,000 in 1917.

Motor Vehicles in Canada. In 1904 the number of motor cars registered in Ontario, the most populous province, was only 535; in 1916 the number was 54,375. In Alberta in 1906 there were forty-one cars; ten years later there were 9,516. In all Canada the number of cars increased from 69,598 in 1914 to 123,464 in 1916.

Related Articles. Consult the following titles for additional information:
Carburetor
Gas Engine
Horse Power
Pneumatic Tires

AUTONOMY, *aw tahn'o mi.* An autonomous nation is one which is privileged to govern itself without the interference of foreign nations. The word is derived from the Greek for *self* and *law* and it means, literally, *freedom in government.* Canada and South Africa enjoy autonomy within the British Empire; after the Russian revolution of 1917 the autonomy of Finland as a republic was recognized by Russia, and in 1918 Denmark accorded like rights to Iceland.

AU'TUMN, the season of the year between summer and winter. Astronomically speaking, in the Northern Hemisphere this season covers the period from the autumnal equinox, about September 22, till the winter solstice, December 22. Popularly, however, in America the term autumn is used to denote the months of September, October and November; and in England, to denote August, September and October.

AV'ALANCHE. High up on the slopes of lofty mountains great masses of snow and ice accumulate. When these masses are started in motion they slide down the mountain with irresistible force, forming what is known as an avalanche. Avalanches are of different classes. Those consisting of fine, dry particles of snow driven down the mountain by a strong wind are known as *wind* or *dust avalanches;* those which consist of great masses of snow sliding down a slope by their own weight are known as *sliding avalanches;* those which are detached by heat from the high glaciers are known as *glacier* or *summer avalanches.* The sliding avalanche is the most dangerous of all, and consists of vast accumulations of snow set free from above, which increase in force as they descend, overthrowing houses, tearing up trees, burying villages and swallowing up forests, cattle and human beings. An avalanche which fell in the Alpine district of Italy, in 1885, contained 250,000 tons of snow.

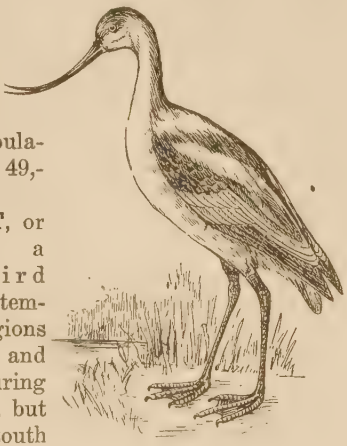
AVE MARIA, *ah'va mah ree'ah* (Hail, Mary), the first two words of the angel Gabriel's salutation to Mary (*Luke* I, 28), and the beginning of the very common Latin prayer to the Virgin in the Roman Catholic Church. Its lay use was sanctioned at the end of the twelfth century, and a Papal edict of 1326 ordains the repetition of the prayer thrice each morning, noon and evening, at the hour indicated by the bells called the Ave Maria or Angelus Domini.

AVER'NUS, a lake now called Lago d' Averno, in Campania, Italy, between the ancient Cumae and Puteoli, about eight miles from Naples. It occupies the crater of an old volcano, and is in some places 180 feet deep. Formerly the gloom of its forest surroundings and its sulphurous vapors caused it to be regarded as the entrance to the infernal regions. It was the fabled abode of the Cimmerians, and was especially dedicated to Proserpine.

AVES'TA. See ZEND-AVESTA.

A'VIARY, a building or enclosure for keeping, breeding and rearing birds. The custom of establishing aviaries has been prevalent in all countries since the times of the early Greeks and Romans, and in England we know that they were in use as early as 1577. At the present date, in all of the zoölogical gardens of Europe and America there are fine aviaries. New York, Washington, Boston, Chicago and other American cities have buildings of this sort, and fine collections of birds are maintained at public expense.

AVIGNON, *a ve nyoN',* FRANCE, a town in the southeastern part of the country, capital of the department of Vaucluse. During the Middle Ages it was for a time the residence of the Popes, a period known as the "seventy years' captivity" (see POPE). The town lies on the left bank of the Rhone, thirty miles from the Mediterranean Sea. There are a number of ecclesiastical buildings, including the Notre Dame Cathedral and the old Papal Palace. The place is an important educational center and is the central wheat market for the district. From 1348 until 1791 the town was the property of the Papacy, but it became a part of France in the latter year. Petrarch lived in Avignon for several years. Population, 1911, 49,-314.



AVOCET

AV'OCET, or **AV'OSET,** a wading bird found in temperate regions of Europe and America during the summer, but migrating south in winter. The bill is long, slender, elastic and bent upward toward the tip. The legs are long, the feet webbed, and the plumage, which is generally light, is varied with black on the wings and brown on the head, neck and breast. In the Western states the avocet is considered a good game bird. It feeds in the marshes, where, with its sensitive beak, it scoops up the worms and small crustaceans.

AVOGADRO'S, *ah'vo gah'drose,* **LAW,** a principle advanced in 1811 by Avogadro, an Italian scientist. This principle asserts that equal volumes of different gases at the same pressure and temperature contain an equal number of molecules.

AVOIRDUPOIS, *av ur du poiz'* (from old French words meaning *goods of weight*), a system of weights used for all goods except precious metals, gems and medicines. In this system a pound contains sixteen ounces, or 7,000 grains. In troy or apothecary weight the pound has 5,760 grains, but the grain is the same in all systems.

A'VON, the name of several smaller rivers in England, of which the most famous rises in Northamptonshire, flows past Shakespeare's birthplace, Stratford, and falls into the Severn, after a course of ninety-six miles.

AX, a steel tool used in felling trees and chopping wood. The thick part of the ax is called the head and contains the eye, into which the handle is driven. The blade of the common ax is wedge-shaped and has a curved edge from five to six inches long and in line with the handle. The handle, also called the helve, is from two and one-half to three feet long, and is for use with both hands. The shape of the ax varies in different countries, but the common American pattern is considered the best. A hatchet is a small ax with a short handle, to be used in one hand. It is used in shingling and lathing. A broadax has a chisel-shaped edge and a wide blade. It was formerly used in hewing timber. The largest factory in the world for manufacturing axes is at Collinsville, Conn.

AX'IOM, a self-evident truth; specifically, in mathematics, certain fundamental relations which are so plain that they require no proof and upon which all processes are based. Among these are the following: (1) that equal quantities added to equal quantities produce equal quantities; (2) that a whole is greater than any of its parts; (3) things equal to the same thing are equal to each other. See ALGEBRA.

AX'IS, the straight line, real or imaginary, passing through a body or magnitude, on which it revolves, or may be supposed to revolve; for instance, the *axis of the earth,* the imaginary line drawn through its two poles.

In botany, the plant stem is the *ascending axis,* the root the *descending axis.*

In anatomy the name is given to the second vertebra from the head, that on which the *atlas* moves.

In mathematics an axis is the straight line about which the parts of a figure or body are symmetrically arranged.

AX'OLOTL, a larval salamander, usually five to six inches long, living in the lakes about Mexico. The young have bushy external gills similar to those of the mud puppy. A remarkable fact about these

AXOLOTL

salamanders is that they remain permanently in the larval condition and never are transformed into adults. One species, the *black Mexican axolotl,* is highly valued as food by the Mexicans.

AYE-AYE, *i-i,* an animal of Madagascar belonging to the lemur family, so called from

AYE-AYE

its cry. It is about the size of a hare, has large, flat ears, a bushy tail, large eyes and long, sprawling fingers, the third so slender as to appear shriveled. In color it is musk-brown, mixed with black and gray ash. It feeds on grubs and fruits, and in its habits it is nocturnal.

AYR, a town in Scotland situated on the Ayr, thirty-four miles southwest of Glasgow. It is memorable for its associations with the poet Robert Burns, who was born at Alloway, about two miles distant. The modern town of Ayr is well laid out and has good buildings and paved streets. The most important structures are the churches, the town hall, the county buildings, the academy, free library and railway station. The leading industries are shipbuilding, tanning and the manufacture of carpets, lace curtains and boots and shoes. Ayr is on a good harbor at the mouth of the river and has quite an extensive commerce, exporting iron, coal and manufactured goods. Population, 1911, 32,985.

AZA'LEA, a genus of plants belonging to the heaths, remarkable for the beauty and fragrance of their flowers and distinguished from the rhododendrons chiefly by the flowers having five stamens instead of ten. Many beautiful rhododendrons whose leaves fall once a year are known under the name of *azalea* in gardens. Azaleas are common in North America. An Asiatic species, famous for the stupefying effect which its honey is said to have produced on Xenophon's army, is also common in gardens and shrubberies, and another is a brilliant greenhouse plant. Shades of red and pink predominate, though there are yellow azaleas.

AZALEA

AZO'IC ERA, a term formerly applied to the earliest division of geologic time, now called the Archeozoic Era. Its rock formations are known as Archean. See ARCHEAN SYSTEM; GEOLOGY.

AZORES, *a zorz',* or **WESTERN ISLANDS**, a group of islands belonging to Portugal, in the North Atlantic Ocean. They are nine in number and form three distinct groups: the northwest, consisting of Flores and Corvo; the central, consisting of Terceira, São Jorge, Pico, Fayal and Graciosa; and the southeast, consisting of São Miguel (Saint Michael) and Santa Maria. São Miguel, Pico and Terceira are the largest. Angra, on the island of Terceira, is the capital of the archipelago. The islands are volcanic and subject to earthquakes, and are conical, lofty, precipitous and picturesque.

The most remarkable summit is the peak of Pico, about 7,600 feet high. There are numerous hot springs.

The Azores are covered with luxuriant vegetation, and have many different woods, besides cornfields, vineyards, lemon and orange groves and rich open pastures. The mild and somewhat humid climate, combined with the natural fertility of the soil, brings all kinds of vegetable products rapidly to perfection, but the prosperity of these islands is hindered by the lack of good harbors. The Azores were discovered by Cabral about 1431, shortly after which they were taken possession of and colonized by the Portuguese. When first visited they were uninhabited, and had scarcely any animals except birds.

There were numerous hawks, called in Portuguese *acores,* to which the islands owe their name. In 1919 the people of the Azores announced their desire to have the islands annexed to the United States. Population, 1911, 242,613.

AZOV, *a zof',* Sea of, an arm of the Black Sea, with which it is united by the Strait of Kertch. Its length is about 170 miles, its breadth about eighty miles and its greatest depth not more than eight fathoms. The western part, called the Putrid Sea, is separated from the main expanse by a long sandy belt called Arabat, along which runs a military road. The sea teems with fish. The Don and other rivers enter it, and its waters are very fresh.

AZ'TEC, a race of people who settled in Mexico and ultimately extended their dominion over a large territory. They were still expanding under their most celebrated ruler, Montezuma, at the time of the arrival of the Spaniards, by whom they were speedily subjugated, in the early part of the sixteenth century. They had a considerable knowledge of agriculture, maize and the agave being the chief products. In metal work, feather work, weaving and pottery they possessed a high degree of skill. To record events they used hieroglyphics, and their lunar calendars were of unusual accuracy. Two special deities claimed their reverence, the god of war, propitiated with human sacrifices, and Quetzalcoatl, the beneficent god of light and air, with whom at first the Aztecs were disposed to identify Cortez. Their temples, with large terraced pyramidal bases, were in the charge of an exceedingly numerous priesthood, with whom lay the education of the young. See Indians, American; Montezuma; Cortez, Hernando.

AZ'URITE, a crystallized copper carbonate, usually found in copper ores. It is found near Lyons, France; in Siberia and in Arizona. When occurring in large quantities and uncrystallized, it is used as a source of copper. Some varieties are cut into slabs and used for table tops, and others, especially those found in the mines of Arizona, are highly esteemed as gems. It is azure blue in color. It takes a high polish and presents a beautiful appearance.

B

B is the second letter and the first consonant in the English and in all other alphabets which are derived from the Phoenician. It is pronounced solely by the lips, and is distinguished from *p* by being produced by the utterance of voice as well as breath. In related languages it is often found that a *b* in one language is replaced by a *p* in another, especially when it occurs in a terminal position. In the Phoenician alphabet it was called *beth,* a word meaning *house,* and its form bore a resemblance to the rough outline of a house.

In music, B is the seventh note of the diatonic scale, or scale of C. It is called the leading note, as there is always a feeling of suspense when it is sounded until the key-note is heard.

BAAL, *ba'al,* or **BEL,** a Hebrew and Semitic word signifying *lord,* and applied to many different divinities. In *Hosea* II, 16, it is applied to Jehovah himself. Baal-berith (the Covenant-lord), was the god of the Shechemites, and Baal-zebub (the Fly-god) the idol of the Philistines. There were as many Baals as there were towns. This departure from the true worship of God aroused Elijah, and later prophets.

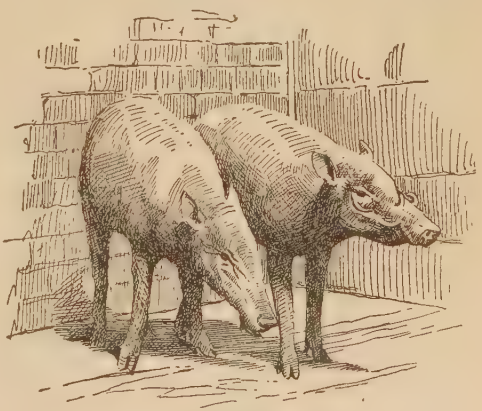
BABBITT, *bab'it,* **METAL,** a soft metal resulting from melting separately four parts of copper, twelve parts of tin and eight parts of antimony, to which, when these have thoroughly mixed, twelve more parts of tin are added. Babbitt metal is used to decrease friction as far as possible in the bearing of journals, cranks and axles. It was invented by Isaac Babbitt, a goldsmith of Boston, Mass., from whom it takes its name.

BABCOCK TEST. See MILK; CREAM SEPARATOR.

BA'BEL TOWER OF, a structure in the plain of Shinar, Mesopotamia, which, according to the eleventh chapter of *Genesis,* was commenced by the descendants of Noah, subsequent to the Deluge. The association of the word with a confusion of sounds has come about through the story of Jehovah's causing the speech of the builders to be "confounded," because they impiously sought to erect a tower that would reach to heaven. *Babel* means literally *gate of God.* The tower of Babel has commonly been identified with the great temple of Belus (or Bel), one of the chief edifices in Babylon.

BAB-EL-MANDEB, *bahb'el mahn'deb,* a term which means *gate of tears,* is a strait between the Indian Ocean and the Red Sea, formed by projecting points of Arabia, in Asia, and Abyssinia, in Africa. Its width is fifteen miles at its narrowest part. Its importance increased after the building of the Suez Canal, for it became the outlet for European commerce into the rich Indian country.

BABIRUSSA, or **BABYRUSSA,** *bab i-roo'sa,* a wild hog which inhabits Celebes and other East Indian islands. It is an active animal, with a nearly naked skin, and



BABIRUSSA

does not root in the ground as do other members of its family. The upper canine teeth do not grow downward, but upward, through openings in the skin of each side of the snout, and they curve backward nearly to the eyes. The natives hunt the babirussa for its delicately flavored flesh.

BABOON, *bab oon'*, a common name applied to a division of Old-World apes and monkeys. They have long, abrupt muzzles like a dog, strong tusks or canine teeth, usually short tails, flabby cheek-pouches and small, deep eyes, with large eyebrows. Their hind and fore feet are well proportioned, so that they run easily on all fours, but they do

BABOON

not maintain themselves in an upright posture with facility. They are generally of the size of a moderately large dog, but the largest, the mandrill, is, when erect, nearly the height of a man. They are almost all confined to Africa and are ugly, sullen, fierce and gregarious, defending themselves by throwing stones or dirt. They live on fruits and roots, eggs and insects.

The *chacma* or *pig-tailed baboon*, is found in considerable numbers in parts of the South African colonies, where the inhabitants wage war against them on account of the ravages they commit in the fields and gardens. The *common baboon*, of a brownish yellow color, inhabits a large part of Africa farther to the north. The *hamadryad* of Abyssinia is characterized by long hair, forming a sort of shoulder cape. See MANDRILL; APE; MONKEY.

BABYLON, *bab'i lon*, the capital of ancient Babylonia (which see), at the height of its glory the mightiest and most splendid city of the ancient world. It was a royal city 3,500 years ago, but that old capital was destroyed in 689 B. C. by Sennacherib. A new city was built by Nabopolassar and his great son Nebuchadnezzar, and it was under the reigns of these two that Babylon reached the zenith of its power.

Tradition informs us that this new city of Babylon covered over twelve square miles; that the surrounding walls were more than fifty miles in length and of such thickness as to defy the strongest of enemies. Excavations have partially verified these estimates. It contained the celebrated "hanging gardens," built by Nebuchadnezzar for his Medean wife, who was desolated by the flat, ugly country to which her husband had brought her (see HANGING GARDENS OF BABYLON). Here also was the Biblical Tower of Babel, where the confusion of tongues resulted (*Genesis* XI). Cyrus the Great captured Babylon in 538 B. C., after which the decline of the city was rapid. Excavations have disclosed numerous and valuable inscriptions in cuneiform characters. See EXCAVATIONS IN ANCIENT LANDS; CUNEIFORM INSCRIPTIONS.

Tablet from a Babylonian library

BABYLONIA, *bab i lo'ni a*, the earliest empire in the history of the world, known as early as 5000 B. C. The name was derived from its capital city, Babylon, and was applied in the Old Testament to the whole district over which the Babylonians ruled. It was a district of Mesopotamia, situated between Assyria and Susiana on the north, with the Tigris River and Chaldea on the east, and the Arabian Desert on the west. With the country are associated the names of Sargon, Sennacherib, Nabopolassar, his great son Nebuchadnezzar, the mightiest of Babylonian monarchs (see NEBUCHADNEZZAR), also Cyrus the Great and Alexander the Great.

According to the Babylonian inscriptions,

the district consisted of several divisions, the northern part being known in the earliest days as Akkad, or Accad, and the southern part as Shumar, or Shinar. The surface is an alluvial plain, formed in great part through deposits by the river. At one time the plain was covered with a network of canals and was very fertile, but it is now a cheerless waste.

People. The Babylonians were a quick-witted, commercial people, fond of letters and other peaceful pursuits. Their language closely resembled that of the Hebrews and Phoenicians. It was written in cuneiform characters, first on papyrus leaves and later on clay tablets (see CUNEIFORM INSCRIPTIONS). In bulk the remains of the literature are immense, and consist largely of hymns, prayers, omens and incantations, but include, also, epics, myths, legends and historical works. There are also works on science, agriculture and commercial law, which show that some important progress had been made along these lines. The system of government was a pure despotism, with viceroys ruling the provinces under the king, who dwelt in luxurious seclusion from the people. The worship of the dead played a prominent part in the Babylonian religion.

Art. In Babylonia, architecture as a fine art was first practiced. The material used was sun-dried bricks, and the tools used in building were very simple. As the land was flat, the buildings were erected on high platforms of brick, reached by stairways. Statues, both standing and seated, carved basins and low reliefs show that the Babylonians practiced sculpture in more varied forms than the Assyrians, but, probably owing to their lack of stone, they never attained to the skill of their neighbors.

History. The date of the settlement of Babylonia is unknown, nor is it known positively whence the ancient Babylonians came. From the cuneiform inscriptions it appears that the first settlers were Semites who came from the upper Tigris-Euphrates region. These people mingled with the Aryans and Caucasians, and by 4000 B. C. they had reached a high state of culture. Detailed information concerning the history of Babylonia begins about 2300 B. C., with King Hammurabi, who united all the southern states of Mesopotamia under his power and placed the seat of government at Babylon. About 1900 B. C., or earlier, began the colonization of Assyria by the Babylonians. Once established, Assyria grew to be a rival of the parent state, and wars between the two nations were almost constant. From about 1782 B. C., Babylonia was ruled for over five centuries by a people known as the Kassites, who came from Media.

During the next two hundred fifty years, no less than four changes in dynasties took place, native Babylonians alternating with Kassites. In 1026 B. C. a native ruler came to the throne. But about this time Assyria began to interfere in Babylonian affairs, and in 710 B. C. Sargon II, a powerful king of Assyria, reduced Babylonia to an Assyrian province, although its final subjugation was not effected until 689 B. C., when Sargon's son Sennacherib destroyed Babylon. Less than one hundred years later, when the Assyrian power began to wane, the Babylonians, incited by Nabopolassar of Chaldaea and aided by a horde of Medes under Cyaxares, revolted and, marching into Assyria, took and destroyed Nineveh.

Nabopolassar then established the new Babylonian kingdom, about 626 B. C. His son, Nebuchadnezzar, ruling from about 604–561 B. C., was the most powerful monarch who ever sat on the Babylonian throne. He conquered Jerusalem and Tyre and ravaged Egypt along the shores of the Mediterranean. Moreover, he raised Babylon to its highest degree of splendor and power. Nebuchadnezzar was succeeded by a line of weak kings, and the country was in a constant state of turmoil until 538 B. C., when Cyrus the Great captured Babylon. After this Babylonia was a Persian province until, with the conquest of Alexander the Great, it passed under Greek control and then into the hands of the Parthians. After Alexander's death the country was neglected, and owing to the perishable quality of the building materials, the cities soon were in ruins. See BABYLON; ASSYRIA; EXCAVATIONS IN ANCIENT LANDS.

BACCHUS, *bak'kus* (Dionysus), the god of wine, son of Jupiter and Semele. He first taught the cultivation of the vine and the preparation of wine. In art he is represented usually as naked, but sometimes he has an ample mantle about his shoulders or a fawnskin across his breast. He is often accompanied by Silenus, Bacchantes or satyrs. The Bacchanalia, the feasts periodically held in his honor, were so licentious that they were abolished by the Roman Senate in

187 B. C. Bacchante was the name given generally to a female taking part in such feasts and processions.

BACCIO DELLA PORTA, *bah'cho del'lah por'tah.* See BARTOLOMMEO, FRA.

BACH, *bahK*, JOHANN SEBASTIAN (1685–1750), the earliest of the German composers of first rank. Because of his influence on the great musicians who followed him, he is sometimes called the "master of masters." Descended from a long line of musicians, he was early trained in the art and soon distinguished himself. In 1703 he was engaged as a player at the court at Weimar and subsequently held an appointment at Leipzig. As a player on the harpsichord and organ he had no equal among his contemporaries; but it was not till a century after his death that his greatness as a composer was fully recognized. His compositions include studies for the organ, piano, stringed and keyed instruments; church cantatas; oratorios; masses, and passion music. It is as a composer for, and performer upon, the organ that his fame is most secure, and especially through his fugues, which are considered the most perfect ever written. More than fifty musical performers have proceeded from this family. All of his eleven sons were distinguished musicians.

BACH'ELLER, IRVING (1859–), an American novelist, born at Pierpont, N. Y. He was graduated at Saint Lawrence University and was connected successively with various daily papers in New York City as reporter. Before 1900 he also wrote for periodicals, published two books and conducted a syndicate for supplying magazines with literary material. His *Eben Holden, D'ri and I* and *Darrel of the Blessed Isles,* each with a setting near his early home, achieved a success which was not increased by a later novel, *Vergilius,* picturing Rome at the beginning of the Christian era. Among later novels were *Silas Strong, The Handmade Gentleman, The Master, Keeping Up with Lizzie, Charge It, The Turning of Griggsby* and *Marryers.*

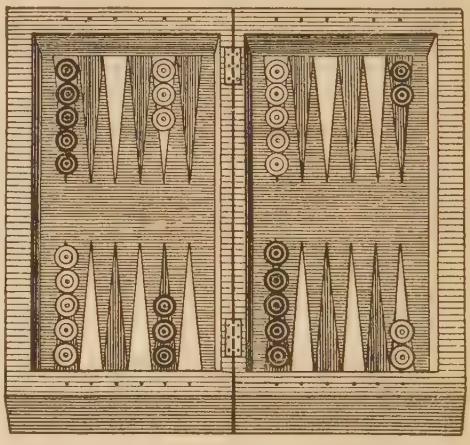
BACHELOR'S BUTTON, a name given to the double-flowering buttercup, with white or yellow blossoms, and to the common blue cornflower, as well as to other species whose flower heads resemble buttons.

BACHELOR'S DEGREE, the title, honor or distinction, represented by an engraved certificate, conferred upon a student in college or university upon completion of a prescribed course of study extending, usually, through four years. It is referred to as the *undergraduate degree* and the *baccalaureate degree.*

Some schools confer but one bachelor's degree, that of bachelor of arts (B. A. or A. B.). Others reserve this distinction for those whose courses have comprised Greek and Latin, and upon others confer the degrees of bachelor of science (S. B. or B. S.), bachelor of philosophy (B. Ph. or Ph. B.), bachelor of letters (B. L.) or bachelor of law (LL. B.). The most advanced schools seldom recognize the degree of bachelor of letters. See MASTER'S DEGREE.

BACILLUS, *ba sil'lus,* the name applied to certain minute, rodlike organisms, forming one of the three principal classes of bacteria which often appear in putrefactions. One bacillus is believed to be the cause of tubercles in the lung, and is thought to be present in all cases of consumption. See BACTERIA AND BACTERIOLOGY.

BACK'GAMMON, a game played by two persons upon a board, made for the purpose. Each end of the board has six points colored alternately red and black. Each of the two players has fifteen "men," or checkers. Two



BACKGAMMON BOARD

dice are used, and the throw from these determines the number of the point on which a man can be placed; or, after all have been placed, the number of points it can be moved onward or the point from which it can be thrown off in the fourth section. The game is won by the player who first moves all men from point to point around the table and throws them off from the last section. At

any time when a point holds two men it is covered, and the other player is unable to put a man upon it. If only one man is on a point, the opponent may remove it if one of his men can be placed upon that point, in which case the man removed must be entered and played around again. Neither player can move forward until all his men are entered on the first section; nor can he throw off until all men are upon the last section.

BA'CON, salted and smoked meat prepared from the sides and back of the hog. The name is also given to hams and shoulders that have been pickled and smoked. Bacon is usually dry-salted and then smoked. It has high value as a heat-producing meat and is prized also because of its agreeable flavor. It is therefore a valuable cold-weather food.

BACON, FRANCIS (1561–1625), an English philosopher, writer and jurist, whose greatest contribution to learning was his elucidation of the inductive method of reasoning. He is also renowned for his development of the essay. The following anecdote shows his inborn courtesy. When he was a boy, Queen Elizabeth asked him how old he was. He gave the courtly reply, "Two years younger than your majesty's happy reign." Bacon was admitted to the bar when twenty-one years old, entered Parliament at twenty-three, filled various legal offices, and in 1618 was created lord high chancellor. Three years later he was created Viscount of Saint Albans. An unfortunate blot on his career was his yielding to offers of bribery while a judge. He was fined $200,000 and sentenced to the Tower during the king's pleasure. Subsequently his punishment was practically remitted. In connection with this phase of his character Pope described him as the "wisest, brightest, meanest of mankind."

FRANCIS BACON

Bacon was a logical successor of Aristotle. He undertook to rearrange the whole system of human knowledge, and though his self-appointed task was too great for him, yet he contributed more to real scientific progress than any other man since the days of the Greek philosophers. The illness of which he died was contracted while he was engaged in an experiment with snow, the success of which has led to the cold storage systems of to-day. The *Novum Organum* was his most pretentious work. His *Essays*, fifty-eight in number, treating of a great variety of subjects, are so full of meaning, so condensed in style and so logical in arrangement, that they repay the closest study.

BACON, ROGER (1214–1294), an English monk, one of the most profound and original thinkers of his day. He first entered the University of Oxford and afterward that of Paris, where he received the degree of Doctor of Theology. About 1250 he returned to England, entered the order of Franciscans, and made researches in physics, which led his ecclesiastical superiors to charge him with practicing "black art," or magic. He was sent to Paris and kept in confinement for ten years. Having been set at liberty, he was again thrown into prison (1278), where he remained for at least ten years. His most important work is his *Opus Majus*, in which he discusses the relation of philosophy to religion, and then treats of language, metaphysics, optics and experimental science. Bacon deserves the gratitude of mankind for the impetus he gave to scientific research. He was one of the few men of his time who could distinguish between superstition and knowledge.

BACON'S REBELLION, a rebellion of colonists in Virginia in 1676, under the leadership of Nathaniel Bacon, against the colonial government headed by William Berkeley. The chief causes of the incident were unequal taxation, enforcement of the navigation laws and Governor Berkeley's vacillating attitude toward the Indians. The last named was the immediate occasion for the outbreak. Bacon, being refused a commission to fight the Indians, organized a force of his own, and returning from the frontier, defied the authority of the governor. Bacon died suddenly of a fever, and the rebellion soon collapsed, but Berkeley executed a number of those who had been prominent in the affair.

Nathaniel Bacon (1648–1676), who was responsible for the above episode in American history, was born in England and was a distant relative of Lord Bacon. He was educated as a lawyer, emigrated to Virginia in

1673, and there he rose to prominence as a land-holder and leader. Because of Governor Berkeley's refusal to proceed against the Indians, Bacon was chosen by the colonists to lead an independent force and succeeded in putting down a serious uprising in 1675. This led to Bacon's Rebellion.

BACTE'RIA AND BACTERIOL'OGY. Bacteria are minute one-celled vegetable organisms, which multiply by transverse division. They are spherical, oval, rodlike or spiral in shape and of exceedingly small size —some being less than $\frac{1}{80000}$th of an inch in diameter. They may be divided into two groups, according to the source from which they obtain nutriment: The *saprophytes*, which live on dead organic matter, and the *parasites*, which live upon living organisms. The saprophytic bacteria are beneficial, for by their aid dead bodies are dissolved into their original elements and contribute to the maintenance of higher plants and animals. In fact, existence without them would not long be possible (see PUTREFACTION). Some bacteria attach themselves to the roots of plants and furnish them with food. Others are used in making acids, cheese and butter, and in many other processes. All fermentation is of bacterial origin.

With the parasites, on the other hand, the conditions are different. Through their activities there is constantly a loss to both the animal and vegetable kingdoms. They rob the organism in which they live of substances it needs to keep it healthy, and at the same time they form substances that are directly poisonous to the tissues in which they are growing. Some bacteria flourish in an atmosphere of oxygen, while to others the presence of this gas is a detriment, and this fact gives rise to another classification.

The principal forms of bacteria are three in number:

(1) The *micrococcus* is a small, oval or round body which grows and multiplies in various ways, so that individuals are found growing in large bunches, in long chains, in fours, in squares, cubes and so on, according to the species. The most common of the micrococci are the pus microbes, golden, lemon-colored and white.

(2) The *bacillus* is a minute rod-shaped organism that varies as to length, breadth and thickness in the different species. The bacilli of consumption and of typhoid are common examples.

(3) The *spirillum* is a minute spiral or comma-shaped germ, which in some species presents letter S curves and in others resembles a bacillus. An example of this form is the spirillum of Asiatic cholera.

An important feature of certain bacteria is their power of spore formation, a process by which an organism is enabled to enter a state in which it resists influences opposed to its growth. It is this property which renders certain germs so harmful, as in this state they resist chemical and physical agents that easily destroy life, even withstanding the action of a temperature of 212° F. for several hours. The bacillus of anthrax is a good example of this. Certain bacteria possess the power of moving about. The propelling power is composed of hairlike appendages, called flagellae, projecting from various parts of the body-wall. This power is possessed preëminently by the bacillus of typhoid.

Bacteria are found everywhere, and they multiply so rapidly that it has been estimated that one bacillus in twenty-four hours will produce sixteen and a half millions.

By their growth bacteria produce certain poisons, called *ptomaines* and *tox-albumins*. This action is the cause of the numerous deaths reported from eating ice cream, sausage, fish and other substances, and of several common diseases.

Bacteriology treats of the character, growth and products of bacteria, and of their effects upon humanity, especially as the causes of disease. Bacteria for study are placed in a flask containing a nourishing material, which is absolutely free from other germs. The nutritive material, gelatin, bouillon, potato, blood serum or whatever it is, must be adapted to the specific bacterium, for not all flourish equally well in any medium.

After the preparation of the medium, it must be made perfectly sterile. This is accomplished by submitting it to the action of live steam for half an hour on three successive days. The object of this "fractional sterilization" is to kill the successive crops of spores as they develop.

When the medium has been properly prepared, a portion of a substance containing the bacteria to be studied is placed with the medium in a flask where it can be kept from contamination, and is submitted to a gentle heat until a growth of the bacteria can be

seen. Small quantities of these are put into other sterilized flasks and the process repeated until finally all the bacteria but the species wanted have been left behind and the desired one grows alone. The bacteria are now studied under the microscope until their form and habits are known and their species is identified. Finally, if the bacteria are thought to be disease-producing, an animal, usually a guinea pig or a rabbit, is inoculated, and if the animal falls ill with the disease which existed where the original specimens came from, the germ is known to be the real cause of the disease.

Through such a laborious process was the bacillus of consumption separated, identified and made known to the world by Koch.

In many cities, laboratories are established for the protection of public health, and in these specific cases are studied after the general method described above, but varied to suit the conditions. Water is examined for indications of typhoid danger; cases of suspected diphtheria, tuberculosis, cholera and other diseases are critically studied and preventive measures advocated.

Related Articles. Consult the following titles for additional information:

Antiseptic
Antitoxin
Diseases of Plants
Fermentation
Germ Theory of Disease
Medicine

BADEN, *bah'den*, one of the twenty-five political divisions comprising the former German Empire. The largest of five grand duchies, it was the fourth state in size in the empire, with an area of 5,823 square miles and a population in 1910 of 2,142,833, an average of 368 to the square mile. Over half of the people are Roman Catholics. The duchy is located in the southwestern part of the country, adjoining Alsace-Lorraine on the west. The reigning Duke of Baden at the outbreak of the World War was Frederick II (born 1857), who succeeded to the throne in 1907. He abdicated in November, 1918, at which time the great empire disintegrated.

Baden is traversed to a considerable extent by the lofty plateau of the Black Forest, which attains its highest point in the Feldberg, 4,904 feet. The principal minerals worked are coal, iron, zinc and nickel. The number of mineral springs is remarkably great, and of these not a few are celebrated. The agricultural interests are important, and the products include wheat, oats, barley, rye, potatoes, hemp, tobacco, wine and sugar-beets. Baden is also famous for its fruits and for its fine wines. Among the important manufactures are textiles, tobacco and cigars, chemicals, machinery, jewelry, pottery ware wooden clocks (confined chiefly to the region of the Black Forest) and musical instruments.

The capital is Carlsruhe, about five miles from the Rhine, and other chief towns are Mannheim; Freiburg-im-Breisgau, with a Roman Catholic university; Baden, with its warm mineral springs, known and used in the time of the Romans, and Heidelberg, having a university founded in 1386, the oldest in Germany (see HEIDELBERG, UNIVERSITY OF).

In the time of the Roman Empire Southern Baden was a part of the province of Rhaetia, which belonged to the Romans. Under the medieval empire it was a military district under the control of a marquis. In 1533 it was divided into Baden-Baden and Baden-Durlach, but these were reunited in 1771. The title of grand duke was conferred upon the ruler by Napoleon in 1806, and in the same year Baden was extended to its present limits. In 1871 it became a member of the German Empire. After the signing of the armistice the duchy was the scene of Spartacan (radical Socialist) outbreaks. Late in February, 1919, the Spartacans were reported to be in control in Mannheim.

BADEN, AUSTRIA, a city five miles southwest of Vienna, which is especially noted because of its hot sulphurous springs, used both for bathing and for drinking. It is generally known as Baden Bei Wien, to distinguish it from other places of the name. Population, 1910, 19,073.

BADEN, GERMANY, a famous watering place in the grand duchy of Baden, eighteen miles southwest of Carlsruhe. To avoid confusion with other Badens, it is usually called Baden-Baden. The town lies in the Oos River valley, on the edge of the Black Forest. Baden has been celebrated from the remotest antiquity for its thermal baths, which are recommended for the treatment of gout, rheumatism and diseases of the skin and kidneys. The town has many good buildings and a castle, the summer residence of the grand duke. The principal industry is wood-carving. Population, 1910, 22,066.

BA'DEN-POWELL, ROBERT STEVENSON SMYTH (1857–), a British soldier, who began his military career with the army in India, afterwards serving in Afghanistan

and South Africa. He acquired distinction as commander of the native troops in Ashantee in 1895, and later in the Matabele campaign. He was in command of the British forces besieged in Mafeking during the South African War, and succeeded in repelling his assailants until he was relieved. Because of his success in defending the place he was promoted to be Major-General. He retired from active service in 1910. Baden-Powell founded in England the organization of the Boy Scouts (which see).

BADGER, *baj'ur*, a carnivorous (flesh-eating) mammal allied both to the bears and to the weasels. The common badger is about the size of a dog, but is much lower on the legs and has a flatter and broader body, a very thick, tough hide and long, coarse hair.

THE BADGER

It inhabits the north of Europe, Asia and America, is indolent and sleepy, feeds by night on vegetables and small quadrupeds, and burrows in the ground. Its flesh may be eaten, and its hair is used for artists' brushes in painting. "Badger baiting," or "drawing the badger," was a barbarous sport formerly practiced. A badger was put in a barrel, and one or more dogs were put in to drag him out. When this was effected he was returned to his barrel, to be similarly assailed again. From this cruel sport came the word *badgering*, which means *worrying*.

Wisconsin is called the Badger State because of the large numbers of badgers formerly found there.

BAD LANDS, the name given to certain lands which, by reason of the absence of natural vegetation, have been greatly eroded by the rains and have been formed into hills and valleys of all sizes. The term is applied specifically to a region in the United States which lies at the upper part of the Missouri drainage basin, partly in South Dakota and partly in Nebraska.

BAEDA, *be'dah*. See BEDE.

BAEDEKER, *bed'e ker*, **TOURIST GUIDES**, a series of travelers' books that are known the world over for their clarity and accuracy. The first hand books, which covered Holland and Belgium, appeared in 1839, and since then nearly all the other European countries have been included, besides parts of North America and Asia. Good maps accompany the reading matter, and the books are kept up to date. The firm publishing the Baedeker guides has its headquarters at Leipzig, Germany.

BAF'FIN'S BAY, a large gulf in the northeast of North America, bounded on the east by Greenland. It is about 850 miles long, and its greatest width is 400 miles. The shores are rocky and high. This bay was named in honor of William Baffin, who explored it in 1616. It is largely an ice sea and is blocked almost solid with ice in the winter.

William Baffin (1584–1622), the discoverer of the bay which bears his name, was born in England and became famous for explorations in the arctic regions. Baffin Land was also named for him.

BAGATELLE, *bag a tel'*, a game played with spherical balls and a cue, on a long, flat board covered with cloth like a billiard-table. At one end of the board are nine cups or sockets of just sufficient size to receive the balls, which are driven from the other end by the cue. Nine balls are used, generally one black, four white and four red, the distinction between white and red being made only for the sake of variety. The black, or "king," ball is placed on a spot in front of the cups, which are all numbered. From the other end of the table the player hits a ball toward the black ball, which must be struck before the player can score. Any ball driven into a cup scores the number of the cup, but a double score is made if the black ball goes in. The winner is the player who makes the highest total.

The name *bagatelle*, which is derived from the French for *trifle*, is used in current speech as a synonym for anything of little or no value.

BAGDAD, *bag'dahd*, the capital of a Turkish province of the same name, situated in the southern part of Mesopotamia, on both banks of the Tigris River. This famous old city, which was a center of Mohammedan wealth and learning in the Middle Ages, came prominently into notice during the World

War. It had long been a part of Germany's plan to extend its influence in Asia by securing through-rail connection from Berlin to the Persian Gulf, and the so-called Bagdad Railway was being constructed when the war broke out. The British conquest of Mesopotamia was an attempt to defeat these plans. Bagdad itself was captured by the British in March, 1917, and the city and fertile surrounding plains were lost to Turkey. British influence remains dominant.

In normal years the city carries on a thriving export trade in Oriental fabrics, carpets, wool, grain, fruit, gum, leather goods, etc., and there are manufactures of copper utensils, cloth and felts. Previous to British occupation there was little in Bagdad to remind one of its former glory except its ruins. The streets were narrow and ill kept, and the private houses uninviting. When the British gained possession they put in clean, modern streets, a sanitary system, electric lighting and a water supply. Mosques and bazars are found in numbers, but the governor's palace and the citadel are the only important public buildings. Population, estimated, from 150,000 to 225,000.

BAG'PIPE, a musical wind-instrument of very great antiquity, having been used among the ancient Greeks. It still continues in use among the country people of Poland, Italy, France, Scotland and Ireland. Though now often regarded as the national instrument of Scotland, it is only Scottish by adoption, having been introduced into that country from England. It consists of a leathern bag and of pipes, into which the air is pressed from the bag by the performer's elbow. In the common, or Highland, form one pipe, called the *chanter,* plays the melody; of the three other pipes, called *drones,* two emit a monotone in unison with one of the lowest notes of the chanter, and the third and longest gives forth a note an octave lower.

BAGPIPE

BAHAMA, *ba ha'mah,* **ISLANDS,** a group of about 3,000 islands and reefs in the Atlantic Ocean, lying northeast of Cuba and southeast of Florida. Most of them are very small, and only about twenty of the group are inhabited. The largest is Great Bahama; the most famous is Watling's Island, believed to be the spot first discovered by Columbus in the New World. The capital is Nassau, on New Providence, the most populous island. Population of the group, 55,944 in 1911.

The principal product is pineapples, which form the chief export, though other fruits are also grown, as well as cotton, sugar, maize and ground nuts. The agave, from which the sisal hemp is obtained, nearly covers the surface of some of the islands. The Bahamas are a favorite resort for invalids suffering from pulmonary diseases. The first British settlement was made on New Providence towards the close of the seventeenth century. See map, UNITED STATES.

BAHIA, *bah ee'ah,* capital of the state of the same name in the republic of Brazil, on the Bay of All Saints, 743 miles northeast of Rio de Janeiro, and 13° south of the equator. Only two cities of Brazil are larger—Rio de Janeiro and São Paulo. The city is the outlet of the sugar, tobacco and cocoa trade of the state, and it exports diamonds and other precious stones; its docks accommodate the largest ocean steamers.

The old part of the town, founded in 1549, is close to the ocean; it was the old colonial settlement, and is unsightly and dirty. The new town, a fine district, on heights 200 feet above tidewater, is reached by hydraulic elevators, for the streets which approach it are too steep for traffic. Population, 1911, 290,000.

BAHIA BLANCA, *bah ee'ah blahng'kah,* the chief seaport on the Atlantic coast of Argentina, is that country's main outlet for its vast shipments of wheat, oats and meats which are shipped to the United States and to Europe. It is on the navigable Neposta River, three miles from the bay of Bahia Blanca. Several million dollars have been spent upon docks and elevators and in dredging. Buenos Aires is 450 miles northeast. The town was founded as a trading post in 1829, but did not begin to grow until 1900,

therefore it is new and modern. Population, 1915, 75,000.

BAIKAL, *bi kahl'*, a lake in Southern Siberia, the largest fresh water lake in Asia. Its length is 375 miles, greatest breadth thirty-seven miles and greatest depth over 4,000 feet. It is surrounded by rugged and lofty mountains. There are seals and many fish, particularly salmon, sturgeon and pike; the seal and sturgeon fisheries are important. This lake is frozen over from December to April. The Trans-Siberian Railway skirts the southern shore of the lake.

BAIL, money or property pledged in behalf of a person under arrest and charged with crime, to assure the court that if given temporary liberty he will present himself for trial when required to do so. A person so pledging his property is called a *bondsman;* the bond is a *bail bond.* The amount of bail is fixed by the court. If the accused escapes and cannot be found on the trial date, bail bonds may be declared forfeit to the state, and collected, whereupon a new warrant is issued for the arrest of the defendant. A bondsman may at any time surrender his client to the court and thus end his responsibility. Murder and treason are not bailable cases.

BAILEY, Liberty Hyde (1858–), American educator, born at South Haven, Mich. He received his college training at the Michigan Agricultural College, from which he graduated in 1882. For a year he was assistant to Prof. Asa Gray at Harvard, for five years professor of horticulture and landscape gardening at Michigan Agricultural College, then from 1888 to 1903 professor of horticulture and from 1903 to 1913 director of the New York State College of Agriculture at Ithaca. In the latter year he retired. Professor Bailey has been a voluminous writer on botany and agriculture. His most important works include *Evolution of Our Native Fruits; Lessons with Plants; Botany, an Elementary Text for Schools; The Nature-Study Idea; The Country-Life Movement.* He is also the editor of *Cyclopedia of American Horticulture; Cyclopedia of Agriculture,* the *Rural Science Series,* and other series of books for young people relating to agriculture.

BAILIFF, *bayl'if,* an officer first known in England as the messenger of a titled person to look after his estate. Later the English bailiff was a subordinate of a sheriff, to collect rents and keep order in court. In the United States he is a court officer having charge of prisoners in court and empowered to serve warrants from the office of the sheriff.

BAIN'BRIDGE, William (1774–1833), an American naval officer who was honored by Congress for gallant service in the War of 1812. During the war with Tripoli, he commanded the frigate *Philadelphia* under Commodore Preble, and while chasing a blockade-runner his vessel grounded on a reef and was obliged to surrender. The captain and his three hundred men were kept as prisoners until the peace, in June, 1805. He sailed from Boston in 1812, in command of a squadron comprising the *Constitution, Essex* and *Hornet,* and late in the year he captured the British frigate *Java,* for which Congress voted him a gold medal. In 1815 Bainbridge commanded the Mediterranean squadron.

BAKER, Ray Stannard (1870–), an American author, was born in Lansing, Mich., and was graduated from the Michigan Agricultural College in 1889. Later he studied in the University of Michigan, specializing in law and literature. Turning to the latter for a career, he became a reporter in Chicago, edited *McClure's Magazine* in New York City, and afterwards was one of the editors of the *American Magazine.* He is best known to the public as a voluminous contributor of social and economic articles to leading periodicals, but has written several noteworthy books, among them being *Seen in Germany, Following the Color Line* and *The Spiritual Unrest.*

BAKERSFIELD, Cal., the county seat of Kern County, 312 miles southeast of San Francisco and 171 miles northwest of Los Angeles, on the unnavigable Kern River and on the Southern Pacific and the Atchison, Topeka & Santa Fe railroads. Natural gas is brought to the city from a distance of forty miles. The city has railroad shops, but the industries largely center in the refining of oil. There are five banks and five hospitals; one of the latter is the county hospital. Population, 1910, 12,727; in 1917, 17,543 (Federal estimate).

BAK'ING POW'DER, a mixture of cream of tartar, soda and starch, or flour, used in raising bread, biscuit and other preparations of flour or meal. The starch or flour serves to keep the cream of tartar and soda from acting upon each other, until the powder is

wet. The principle of baking powder is that when wet, the cream of tartar attacks the soda and sets free carbonic acid gas. This passes through the dough and causes it to rise and become light and porous. Baking powder is liable to be adulterated with alum and ammonia, both of which are injurious, and some states carefully regulate the manufacture of baking powder by law. The alum can be detected by dissolving the powder in cold water. If the water does not foam, alum is present. Ammonia can be detected by dissolving a small quantity of the baking powder in water and boiling. If ammonia is present, the odor can be detected in the steam.

BAKU, *ba koo′,* Russia, a port on the western coast of the Caspian Sea, the chief outlet of the vast petroleum fields of that part of Europe. The industries of the city are largely centered in oil. The city includes a strange combination of ancient, Oriental and modern structures. Its harbor seldom freezes. A considerable trade is carried on in cotton, silk, rice and wine. Baku has long been a place of pilgrimage for the Parsees, or Fire-worshipers; it was founded as early as the tenth century. During the World War it fell into the hands of the Turks; the British captured it in the summer of 1918, were forced to evacuate it in September, but reoccupied it in November. Population, 1913, 232,200.

BA′LAAM, a heathen seer, invited by Balak, king of Moab, to curse the Israelites, but compelled by a miracle to bless them (*Num.* XXII-XXIV). In another account he is represented as helping to lead the Israelites to worship Baal, and as being, therefore, slain in the Midianitish War (*Num.* XXI; *Joshua* XIII).

BALAKLAVA, *bah la klah′vah,* a small port on the Black Sea, in the southwest of the Crimea. In 1854, during the Crimean War, the town was occupied by the British under Lord Raglan. Here the troops suffered great privations, many perishing with hunger and cold. On October 25 occurred the Battle of Balaklava, between the Russians and British. The daring but unsuccessful charge of the British cavalry in this battle has been immortalized by Tennyson in his poem, *The Charge of the Light Brigade.* See Charge of the Light Brigade.

BALANCE. See Steelyard; Weighing Scale.

BALANCE OF POWER, a phase of European politics that belongs to the old order of diplomacy and international relations. By balance of power was meant such an adjustment of strength among nations that the security of no country was menaced, and no one state was permitted to grow so powerful as to threaten the safety of the others. Such a condition was secured by alliances, the object of which was to keep a reasonably even balance between two or more groups of countries whose interests might at any time be in conflict.

The first European monarch whose ambitious designs induced a combination of other states to counteract them was the Emperor Charles V, and similar coalitions were formed in the seventeenth century, when the ambition of Louis XIV excited the fears of Europe. A century later the nations combined against the exorbitant power and aggressive schemes of the first Napoleon. More recent still is the Crimean War, entered into to check the ambition of Russia.

At the outbreak of the World War, Germany, Austria-Hungary and Italy were united in a Triple Alliance for defensive purposes, but Italy refused to join the Central Powers in the war because they were not fighting for defense. France, Great Britain and Russia were allied by the terms of the Triple Entente, and Great Britain and Japan were joined in a dual alliance. These four nations immediately united against the Germanic alliance, and Italy joined them in 1915. At the close of the war the peace delegates of the victorious allies began formulating a constitution of a League of Nations which would do away with the old system of alliances and balances of power.

Related Articles. Consult the following titles for additional information:
Crimean War — Triple Alliance
League of Nations — Triple Entente
Quadruple Alliance — World War

BALANCE OF TRADE, in commerce between nations, is a country's excess of imports over exports, or of exports over imports. When exports exceed imports the balance is *favorable;* if the contrary is true, *unfavorable.* The balance of trade is popularly believed to be a certain index to the prosperity of a country, on the ground that a country is growing in wealth if cash received from other countries through commerce exceeds the money paid them. There are, however, many other factors which make such a conclusion untenable, such as movements of stocks and bonds between holders

in different countries, investments abroad, etc., which must be considered in striking a true balance.

BALBOA, *bal bo'a*, Vasco Nuñez de (1475–1517), a celebrated Spanish explorer, the first European to view the Pacific Ocean from its American shore. Born of a noble but poor family he came to America in search of wealth. From Santo Domingo he went, in 1510, with an expeditionary party to Darien and became governor of the colony there. Hearing from the Indians accounts of a great western ocean, he set out in quest of it and on September 25, 1510, saw the Pacific from a mountain on the Isthmus of Panama. Four days later he reached the water's edge and formally took possession of it and of the shores it washed in the name of Spain, little dreaming the vastness of his claim.

BALBOA

While on his expeditions Balboa resigned the governorship of Darien to Davila, a man of unprincipled character. On his return political dissensions arose between them. The mother country endeavored to harmonize the two interests, but failed. Finally Balboa was accused of rebelling, was convicted and executed, in 1517. A colossal statue of Balboa was a feature of the Panama-Pacific Exposition in 1915.

BALDER, *bawl'dur*, in Northern mythology, the son of Odin and Frigga, the personification of the sun and of the brightness of summer. For his beauty and goodness he was beloved by all of the gods except the wicked Loki, who was determined to accomplish his destruction. Balder's mother, fearful for his life, obtained from all things in the world, with the exception of a little spray of mistletoe which grew upon an oak tree, a promise that they would not injure Balder. It became, therefore, a favorite sport of the gods to hurl their most dangerous weapons at him in order to see them fall harmless. Loki, however, fashioned a dart from the mistletoe, which he put into the hand of Balder's blind brother, directing him how to throw it. The dart struck Balder and he fell dead. In Matthew Arnold's *Balder Dead* the death and funeral of the god are described in beautiful verse.

BALDNESS, the bare condition of the scalp, due to partial or complete loss of hair. It is due to various causes, and affects men much oftener than women; indeed, a bald woman is rarely known, while baldness is common among men. Most usually it results from the approach of age, though men under thirty-five are not immune. It is due to defective nourishment at the roots of the hair, caused by lessened circulation in the scalp. There are many so-called remedies, but they make their appeal chiefly to the credulous.

The best treatment for preventing loss of hair seems to consist in such measures as bathing the head with cold water and drying it by vigorous rubbing with a rough towel and brushing it well with a hard brush. Probably in most cases baldness of old age is unpreventable.

BALDWIN, Robert (1804–1858), a Canadian statesman, born in Toronto, and educated under the direction of Bishop Strachan. He served in the Assembly of Upper Canada, became solicitor-general for Upper Canada in 1840 and was Attorney-General and Premier, 1842–1843. Baldwin's first Cabinet marks the introduction of a responsible Ministry into Canadian government. From 1848 to 1851 he was again at the head of the Cabinet; during this second period the amount of constructive legislation was unprecedented, including the organization of the municipal system as it now exists, the establishment of Toronto University on a non-sectarian basis, the creation of the courts of common pleas and chancery, the opening of the Saint Lawrence to commerce after the repeal of the British Navigation acts and the abolition of the old preferential tariff. A sincere reformer, Baldwin was nevertheless unable to agree with the more radical elements of the Liberal Party, under the leadership of George Brown. He refused to abandon his moderate political views, resigned from office in 1851, and sought reëlection. He was defeated. Thus swept aside by the radicals, Baldwin

ROBERT BALDWIN

always retained the respect and admiration of his bitterest political opponent.

BALEARIC, *bal e air'ik*, **ISLES**, a group of islands, belonging to Spain and forming a Spanish province, situated southeast of Spain and including Majorca, Minorca, Iviza and Formentera. Their combined area is 1,935 square miles. Their products are similar to those of Spain and Portugal. The capital is Parma, on Majorca. In the thirteenth century they constituted an independent kingdom, which was finally united with Spain. Population, 1913, 329,831.

BALFE, *balf*, MICHAEL WILLIAM (1808–1870), an English composer, best known for his melodious and popular opera *The Bohemian Girl*. He was born in Dublin. Balfe could play the violin at the age of seven, and when he was only nine he wrote a ballad that was popular in the music halls. After studying in Italy he began writing operas, producing, besides his favorite, *The Rose of Castile*, *Satanella* and others. Though his operas lack depth, they are distinguished for their bright melodies.

BALFOUR, *bal foor'*, ARTHUR JAMES, Rt. Hon., (1848–), a British statesman, one of the most influential leaders in the conservative party, and Prime Minister of England from 1902 to 1905. He was educated at Eton and Trinity College, Cambridge, and in 1874 was returned to parliament as Conservative member for Hertford. In 1886 he was returned from Manchester. Public attention was soon drawn to him by his quickness of perception and readiness in debate, and he became one of the most effective speakers in the House. From 1878 to 1880 he was private secretary to his uncle, Lord Salisbury, whom he accompanied to the Congress of Berlin. He was appointed president of the Local Government Board in 1885, Secretary for Scotland in 1886 and chief Secretary for Ireland in 1887. His brilliant administration while in this position, at the time one of the most difficult in the British Cabinet, won him the praise of all parties. In 1892 he became first Lord of the Treasury and leader of the House. With the exception of the brief interval when the Liberals were in power he held this position until July, 1902, when, on the resignation of Lord Salisbury, King Edward appointed him Premier and asked him to form a Cabinet. The Liberal victory of 1906 removed Balfour's party from power.

The brilliant Conservative leader did not remain in obscurity, however, and for years he was his party's spokesman in the House of Commons. In 1915, when the World War forced the creation of a coalition Cabinet, Balfour was made first Lord of the Admiralty, and in 1916 became Secretary of State for Foreign Affairs. In 1917 he headed the British commission which visited the United States after America joined the allies in the World War.

Reëlected to Parliament in the general election of December, 1918, he was made Foreign Secretary in the Cabinet formed by Lloyd George in January, 1919. He also was appointed one of the British peace commissioners, and in Paris exercised an influence second only to that of Lloyd George, the great Premier.

BALIOL, *ba'le ol* or *bal'yol*, JOHN DE (1249–1315), a king of Scotland whose claim to the throne was disputed by Robert Bruce. On the death of Margaret, granddaughter of Alexander III, Baliol claimed the vacant throne by virtue of his descent from David, Earl of Huntington, brother to William the Lion. Robert Bruce, a descendant of David by another line, opposed Baliol; but Edward I's decision was in favor of Baliol, whom he induced to swear allegiance to him. Irritated by Edward's harsh exercise of authority, Baliol concluded a treaty with France, then at war with England, but after the defeat at Dunbar he was obliged to give up his crown to Edward. He was sent with his son to the Tower, but in 1297 obtained liberty to retire to his Norman estates, where he died, seventeen years later.

BALKAN MOUNTAINS, whose name is derived from Turkish words meaning *high ridge*, is a range of mountains in Southern Europe, the most easterly extension of the Alpine system. They begin nearly where the boundaries of Hungary, Serbia and Rumania meet, extend southward through Serbia and along the western border of Bulgaria, thence eastward nearly to the Black Sea. The name *Balkan states* is popularly applied to the small countries through which they extend. In the central Balkans are the highest summits, several of which are over 7,000 feet high.

The Balkan section of Europe was long known as the "powder magazine of Europe," because of its dangerous political aspects. See BALKAN WARS; WORLD WAR.

BALKAN WARS, two conflicts between the countries of the Balkan Peninsula, the second the immediate outgrowth of the first, and following it immediately.

The First War. This was a conflict between Turkey and the allied Balkan states, Bulgaria, Montenegro, Serbia and Greece. To understand the underlying causes of the war it is necessary to remember that Turkey, in the early part of the eighteenth century, had acquired possession of the entire Balkan Peninsula, except Montenegro. In the course of the nineteenth century Greece and Serbia became independent and in 1908 Bulgaria's independence was formally proclaimed. For two centuries the Balkan Peninsula had been the scene of almost continuous warfare, sometimes merely internal, but more often with Turkey. There still remained under Turkish rule Macedonia and Albania, whose inhabitants were allied by ties of race and religion to the independent states of the peninsula. Under Turkish rule the Albanians and Macedonians, according to the proclamation of King Ferdinand of Bulgaria, had not been able "to obtain conditions of life that are bearable. To succor the Christian population of Turkey remains to us no other means than to turn to arms. Our work is a just, a great and a sacred one. With faith in the protection and support of the Almighty . . . I order the brave Bulgarian army to march on to Turkish territory." This was the spirit of all the Balkan allies.

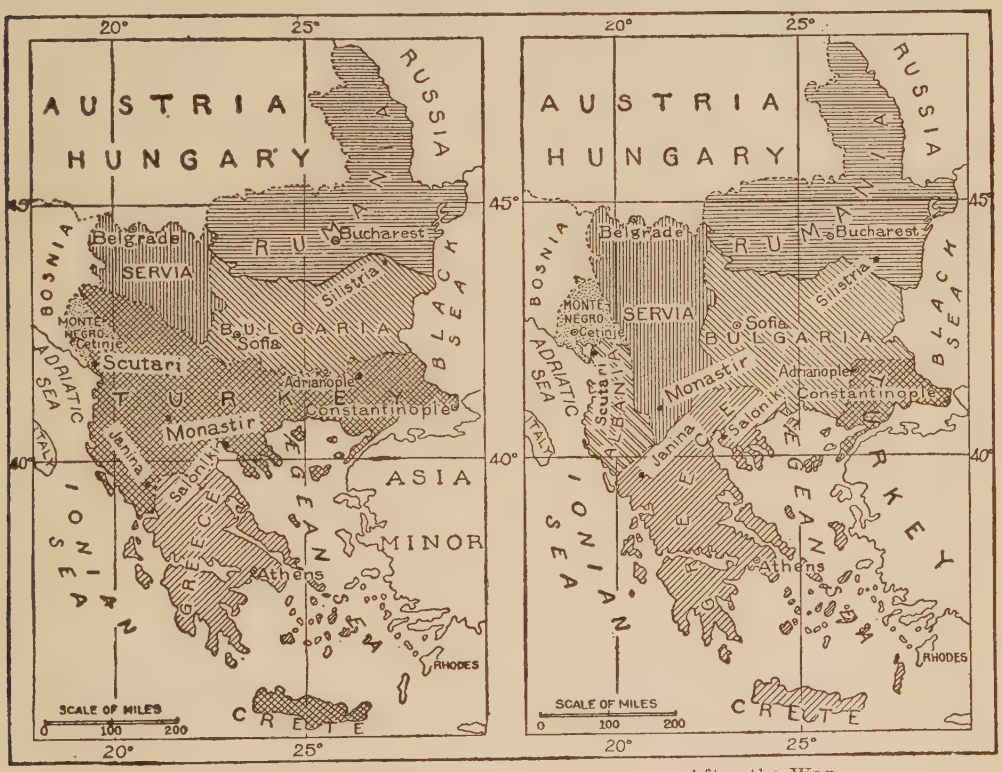
The war was begun by Montenegro on October 8, 1912; nine days later Serbia and Bulgaria were officially declared at war with Turkey, and on the 18th Greece issued her declaration. The allied troops, evidently working out a definite plan, crossed the Turkish borders at once. The Montenegrins and Serbians marched on Scutari and Monastir, the Bulgarians towards Adrianople, and the Greeks on Janina and Saloniki. Monastir and Saloniki were captured in November, 1912. By the end of the year the Turks were confined to Constantinople and several other strongly fortified cities. On December 3, an armistice was proclaimed (except by Greece, whose troops continued to besiege Janina). Delegates were sent to a peace conference in London, but the delays of the Turks so irritated the other delegates that they withdrew from the conference. Hostilities began again in February. In March, Janina and Adrianople were taken, and in April, Scutari. The European powers, urged on by Austria, compelled Montenegro to yield Scutari to them, it being to their interest to make Albania a single weak state rather than to allow the allies to divide it among them. On May 30, the Treaty of London, signed by delegates from each of the countries involved, ended the war. Each of the allies received additional territory and Albania was made a new kingdom.

The Allies against Bulgaria. Long before the Treaty of London was signed it was clear that trouble was inevitable between the Balkan allies. Bulgaria had made a definite and secret arrangement with Serbia, but not with Greece or Montenegro, as to the division of conquered territory. Bulgaria first came to blows in April over the possession of Saloniki, which was claimed by Bulgaria but held by Greek troops. By June 30, 1913, Bulgaria and Greece were openly at war. On July 8, Serbia and Montenegro, and three days later Rumania, also declared war against Bulgaria. Rumania, at the beginning of the war, had been inclined to side with Turkey, but had agreed to remain neutral, with the understanding that it should receive some compensation. Bulgaria refused to accede to Rumania's demands for a cession of territory, and Rumania replied by a declaration of war and by sending troops into the territory in dispute. At the same time Turkish troops, disregarding the Treaty of London, recaptured Adrianople and most of the territory recently taken from them by the Bulgarians. King Ferdinand, deserted by all his allies and actually at war with them, was compelled to sue for peace. By the treaty of Bucharest, ratified on August 25, Bulgaria agreed to the terms as dictated by the other countries, thereby losing much of the territory gained by the war with Turkey.

Summary. The table below summarizes the net result of the two wars, so far as it can be measured in territory and population. Each country gained as follows:

	AREA	POPULATION
Greece	20,000 square miles	1,000,000
Serbia	19,000 square miles	1,100,000
Bulgaria	12,500 square miles	500,000
Rumania	2,500 square miles	250,000
Montenegro	2,000 square miles	200,000

The Balkan States the Next Year. In August, 1914, the World War was precipitated by Austria's action against Serbia, one of the Balkan states. These small countries at once showed a new alignment. Serbia, Montenegro and Rumania joined the entente allies, while Bulgaria and Turkey cast



BOUNDARIES OF THE BALKAN COUNTRIES

frozen from November to April. There are no large cities near it.

BAL'LAD, a term loosely applied to various poetic forms of the song type, but in its most definite sense, a poem which is a short narrative. The old ballads had no single author, and they were handed down orally, thus changing greatly as time went on; but the fact that they belonged to no one person more than to all others kept them simple narratives into which little subjective emotion was introduced. The themes with which they dealt—love, hatred, fear, crime, superstition, war or death—were such as to render them well-nigh universal in their appeal. The theory is now generally accepted that they are the spontaneous outgrowth among primitive people of a desire to seek relief in moments of solemnity.

Every European nation, Greece, France, Germany, Norway, Sweden, England, Denmark, Portugal and Italy alike, has its collection of ballads and folk-songs of dateless age and unknown, or folk, origin. Spanish

their lot with the Germanic countries. Greece endeavored to remain neutral. See WORLD WAR.

BALKASH, *bal kahsh'*, LAKE, the fourth largest body of fresh water in Europe and Asia, situated near the southwestern part of Siberia, about 200 miles from the western boundary of China. Its area is 8,600 square miles—nearly as great as that of Lake Erie. It is long and narrow, being from six to fifty-four miles wide and 330 miles long. The fisheries are unimportant, and the lake is

literature is unusually rich in its collection of ballads; and recent researches have revealed an unexpected wealth among the Serbians, who are still producing ballads or maintaining those they have. No systematic effort to collect ballads and study them was made until the publication of Percy's *Reliques* in England in 1765. This served as an impetus to widespread study of the ballad, and attempts to gather the folk-songs from those who were still reciting them as they were handed down by word of mouth. The result of this study in England was a greater spontaneity in poetic form, as shown by the poems of Coleridge, Wordsworth and Scott. In Germany, France, and other countries a similar revival of interest, with similar results, was taking place.

Another important English collection was Scott's *Border Minstrelsy,* published in 1802–03. Such poems as Tennyson's *Revenge,* Rossetti's *King's Tragedy* and *Sister Helen,* and Coleridge's *Ancient Mariner* are imitations or adaptations of real ballads. In America Longfellow wrote many ballads. One of the best known—*Wreck of the Hesperus*—is given in full in the article *Language and Grammar* (section for fifth year). In the same section may be found Campbell's *Lord Ullin's Daughter.*

BALLARAT, *bal a rat′,* the second city in size in the federated state of Victoria, Australia. It is seventy-five miles northwest of Melbourne, the metropolis and capital. The city is in a rich gold-producing country, and the largest industries center around mining. Ballarat was the scene of one of the earliest gold discoveries in Victoria, June, 1851. A nugget weighing about 184 pounds, the largest ever discovered, was found at Ballarat and was sold for $52,500. Quartz mining is now the leading feature of the district; gold-bearing reefs are remuneratively worked at a depth of 900 and 1,000 feet. The town of Ballarat consists of two distinct municipalities, Ballarat East and Ballarat West, with an aggregate population of 42,478 (1914). It has iron-foundries, breweries and distilleries, several flour mills and other factories. It is connected by railway with Melbourne and Adelaide.

BALLET, *bal lay′,* a kind of dance, now used chiefly as interlude in a theatrical performance. Its original aim was to represent actions and feelings through dancing and gestures. This idea arose early in the eighteenth century, but the modern ballet differs greatly from the original, for it is now rather a spectacular dance than a dramatic representation, the main purpose being rather to please the eye than to impress the mind. The ballet as used in modern operas is more nearly the ballet of old, for it is usually more or less closely connected with the play and incorporated in it, as in *Faust* and *Tannhäuser.*

BALLOON′, a gas-tight bag or envelope, made of light material and filled with heated air or other gas lighter than ordinary air, so that it will rise and float in the atmosphere. Balloons are either spherical or pear-shaped. Those used for making voyages are covered with a strong net of cords, to the lower extremity of which the basket or car is attached. The first balloons were constructed by the Montgolfier brothers in France in 1783. Their balloon rose to a height of over a mile, and the experiment attracted the attention of a large number of scientific men. A few months later a balloon made of silk and coated with rubber varnish, to make it gas-tight, was filled with hydrogen. This ascended to a height of 3,000 feet and traveled 15 miles before lighting. It was torn into shreds by the terrified inhabitants in whose neighborhood it descended. The success of this experiment by Professor Charles, a leading physicist of Paris, led to the first successful balloon ascent.

The modern balloon differs but very little from the one first constructed by Professor Charles. It contains a valve in the top for the escape of gas, and the mouth, through which it is filled, is left open so that the gas may escape when it expands on reaching high altitudes. The valve closes with a spring and is opened by a cord which reaches to the car. Since the discovery of illuminating gas, that has taken the place of hydrogen for inflating balloons, because it is much cheaper and because it does not escape as readily through the bars in the bag. However, this gas is much heavier than hydrogen, and the lifting

power of a balloon filled with it is only about one pound for every thirty cubic feet of gas. Therefore, balloons designed for long voyages or to carry heavy loads need to be of large size. Some have been constructed having a diameter of 118 feet and a lifting capacity of over 55,000 pounds. The car is usually constructed of willow or some other light, strong material, and, besides the aeronaut, it contains thermometers, barometers and occasionally other instruments for recording atmospheric conditions. The aeronaut must be provided with a certain amount of ballast, which is usually in the form of sand, since by the use of this and the escape valve he is able to control the ascent and descent of the balloon.

Uses in Time of Peace. Balloons are used by meteorologists for securing information about the temperature, humidity and currents in the upper air. The two most remarkable voyages for this purpose are that of Glaishar and Coxwell in 1862, reaching an altitude of 29,000 feet, and that of Burson and Suring of Berlin in 1901, when by inhaling oxygen an altitude of 31,000 feet was reached. Unmanned balloons carrying self-recording instruments have reached an altitude of 72,000 feet, or 13½ miles.

Balloon Races. Europe has for years been accustomed to witness balloon races, the contests being open to the world since 1906. The records of winners is given below:

YEAR	WINNER	DISTANCE
1906	America (American)	402 miles
1907	Pommern (German)	880 miles
1908	Helvetia (Swiss)	620 miles
1909	America II. (American)	695 miles
1910	America II. (American)	1,171 miles
1911	Berlin II. (German)	471 miles
1912	Picardie (French)	1,354 miles
1913	Goodyear (American)	400 miles
1914, 1915, 1917, 1918, 1919	no contests	

Balloons in War. Great, sausage-shaped balloons, called captive balloons, because the height to which they soar is controlled by wires connecting the bag with machinery on the ground, were most valuable devices with all armies throughout the World War. They were allowed to rise, carrying observers, photographers, telephone and wireless telegraph operators, and were held stationary in the air until the objects sought were achieved or until forced down or shot down by the enemy. See FLYING MACHINE, subhead *Dirigible Balloons.*

BALLOT, a device used for secret voting. The name is also given to the total number of votes cast on any question. The present word is from the French *ballotes,* meaning *little balls,* so called because small balls colored white and black were once used in casting the vote. A white ball was used for an affirmative vote; a black ball for a negative. However, the custom of secret voting dates back to the days of ancient Greece and Rome, where balls, stones or shells were used.

Modern practice has changed the ballot to pieces of paper on which are written or printed the object of the vote. The plan of ballot which best safeguards the public welfare in political matters is the Australian ballot.

Related Articles. Consult the following titles for additional information:
Australian Ballot
Election
Short Ballot
Voting Machine

BALL'S BLUFF, BATTLE OF, one of the first important battles of the Civil War, fought October 22, 1861, at Ball's Bluff, Va., between a detachment of about 2,000 Federals of McClellan's army and a Confederate force which was lying in ambush. After a hand to hand fight, the Federals were driven in confusion from the field with a heavy loss.

BALM, *bahm,* a fragrant perennial herb belonging to the mint family, a native of the south of Europe and Western Asia and naturalized in a few places in England. It has long been cultivated in gardens; the stems and leaves are still occasionally used in medicine as a gentle stimulant and tonic, and were formerly in high repute. The taste is somewhat bitter, and slightly aromatic. A variety of the common catnip, with a smell like that of balm, is often mistaken for it. Moldavia balm is a native of Eastern Europe and Siberia. Bastard balm, a native of the south of England and of many parts of Europe, is a beautiful plant. When dried it has a delightful fragrance, which it retains for a long period.

BALM OF GIL'EAD, the gum from a tree native to Southern Syria and Northeastern Africa. It has a yellowish or greenish color, a warm, bitterish, aromatic taste, and a sharp, fragrant smell. This gum, which is obtained from incisions in the trunk of the tree, is valued for its fragrance and its supposed medicinal powers.

BALSAM, *bawl'sam,* an aromatic, resinous substance flowing from certain plants.

A great variety of substances pass under this name. In chemistry the term is confined to such vegetable juices as consist of resins mixed with volatile oils. The balsams are soluble in alcohol and ether and are capable of yielding benzoic acid. They are either liquid or more or less solid; as, for example, the balm of Gilead and the balsams of Copaiva, Peru and Tolu. Benzoin, dragon's-blood and storax are not true balsams, though sometimes called so. The balsams are used in perfumery, medicine and the arts. See BALM OF GILEAD.

BALTIC SEA, an inland sea or large gulf in Northern Europe, washing the coasts of Denmark, Germany, Russia and Sweden. A chain of islands separates the southern portion from the northern, which is called the Gulf of Bothnia. The northern extension includes the gulfs of Riga and Finland, indenting the coast of Russia, and the Gulf of Bothnia, between Russia and Sweden. The Baltic receives the drainage of a large part of Northern Europe, and more than 250 rivers flow into it. Owing to this drainage, the water of the Baltic contains only one-third as great a per cent of salt as the Atlantic. There is a large trade, the important harbors being at the cities of Copenhagen, Kiel, Danzig, Memel, Riga, Kronstadt and Stockholm. The Kaiser Wilhelm Canal, near Kiel, affords access to the North Sea (see KAISER WILHELM CANAL). Storms are frequent, often causing severe losses, and navigation in the northern part is hindered by ice during the winter season.

The Baltic Sea is of great commercial importance to Northern Europe, and control of it has long been sought by different powers. During the World War Germany obtained temporary supremacy there by the defeat of Russia and the organization of a Finnish state under German protection. See CATTEGAT; SKAGERRAK.

BALTIMORE, GEORGE CALVERT, Lord (1580–1632), a British statesman whose name is associated with the founding of Maryland. He was for some time secretary of state to James I, but this post he resigned in 1624 in consequence of having become a Roman Catholic. Notwithstanding this, he retained the confidence of the king, who in 1625 raised him to the Irish peerage. He had previously obtained a grant of land in Newfoundland, but as this colony was much exposed to the attacks of the French, he left it and obtained another patent for Maryland. It was his desire to organize a colony where Roman Catholics could worship without molestation. Lord Baltimore died before the charter was completed, and it was granted to his son Cecil, who founded the colony. See MARYLAND.

Battle Monument

BALTIMORE, *bawl'ti mohr*, MD., one of the oldest cities in the United States and the seventh in size in 1918. It is the metropolis of the state, situated on the north side of Patapsco River, fourteen miles from Chesapeake Bay, of which the river is a broad estuary, and is ninety-four miles south of Philadelphia and forty-two miles northeast of Washington. Population, 1910, 558,485; in 1916, 589,621 (Federal estimate).

The city rises from the water front in a gradual slope toward the north. The wholesale and manufacturing districts are on and about the branches of the river, the northwest branch extending almost into the center of the city and giving ample opportunity for docks. The greatest extension of the city is from east to west, and the principal streets running in this direction are Baltimore and Lexington, while Charles is the principal street running north and south. The city is divided into nearly equal east and west portions by a small stream called Jones Falls. This stream was covered in 1914, the water now being led through three large concrete tubes; where the stream once was there is now a 75-foot wide boulevard. The residential and newer part of the city is in the west and northwest sections, while the eastern portion contains most of the old town. Baltimore Street and Charles Street divide the city into four parts, and the numbering extends from these streets in each direction.

Parks and Boulevards. The city has a number of beautiful and interesting parks. Chief among these is Druid Hill Park, containing Druid Lake and noted for its beautiful walks and drives and a number of monuments and statues. This park is situated in the northwestern portion of the city. In the northeast portion is Clifton Park,

containing Clifton Lake, and in the eastern section, near the river, is Patterson Park, which includes a number of squares. Besides these, there are several small parks so distributed through the city that they are within easy access. Carroll Park was the former home of the Carrolls, who were prominent in the early history of the country.

In the center of the city, between Fayette and Lexington streets, is Monument Square, which contains the battle monument erected in 1815 to the memory of those who fell in the defense of the city in the War of 1812. The Washington Monument, erected between 1815 and 1830, stands in the heart of the city, at the intersection of Mount Vernon Place and Washington Square; the colossal statue of Washington is mounted upon a Doric column. It was the early erection of this structure that gave Baltimore the name of the "Monumental City." Other monuments and statues of note are the one to the memory of Columbus, the statue of Sir William Wallace and the Wildey Monument, erected to the founder of the Order of Odd Fellows in the United States. There are a number of cemeteries in and about the city which are noted for their extent and beauty. Chief among these are Greenmount Cemetery, Loudon Park and the National Cemetery, containing the graves of a large number of Union soldiers. In one of the small churchyards (Westminster) is the grave of Edgar Allan Poe.

Commerce and Industry. Baltimore is favorably situated for both domestic and foreign commerce. The city has an excellent harbor at the head of Chesapeake Bay, is well sheltered and deep enough for the largest ocean vessels. Consequently lines of steamers are maintained between the city and nearly all important European ports. It is also an important railroad center, being one of the chief points on the Baltimore & Ohio, the Pennsylvania, and the Western Maryland systems. Branches of these extend north, south and west. The city is first in all the world in oyster packing, for in Chesapeake Bay are the most famous of oyster beds, and in the manufacture of fertilizers, straw goods and cotton ducking. It holds high rank as a fruit-canning center.

Buildings. The city is well built, but most of the older structures are of brick. Chief among the public buildings are the city hall, which occupies an entire square and cost over $2,271,000. This is a marble structure and is noted for its immense dome, which is 260 feet high. To the west of the city hall is the United States government building, and beyond this the United States courthouse, which is a massive granite structure. The Masonic Temple, near the intersection of Charles and Saratoga streets, is also worthy of mention. The most important churches are the Roman Catholic cathedral, a granite structure in the form of a cross; the Mount Vernon Methodist church, of green serpentine; the First Presbyterian church and the Unitarian church. Among the commercial buildings, that of the Baltimore & Ohio railroad is one of the most noted, and one of the finest, office buildings in America. Other great structures are the Equitable, Continental, Fidelity and American buildings.

Institutions. Baltimore maintains an excellent system of public schools, and has, in addition, the Peabody Institute, containing a free library of over 130,000 volumes; the Athenaeum, which contains collections of the Maryland Historical Society and the libraries of this society and the Mercantile Library Association; the Maryland Institute, designed for the promotion of mechanic arts; the Johns Hopkins University (which see), one of the greatest institutions of higher learning in the world; Goucher College, an advanced institution for women only; the University of Maryland; the Pratt Free Library, which contains over 200,000 volumes; the Baltimore College of Dental Surgery, the oldest dental college in the world; the College of Physicians and Surgeons, and Maryland College of Pharmacy. Morgan College is for colored students. There are many other schools of high grade.

The Peabody Institute, founded by George Peabody, comprises a great library of 180,000 volumes, an art gallery and a conservatory of music. More than $1,250,000 was devoted to its organization.

There are over twenty charitable institutions, supported by the city or state or by private contributions.

History. The city was founded in 1729 and named in honor of Lord Baltimore, proprietor of the Maryland colony. It was incorporated in 1796. Baltimore suffered a bombardment in the War of 1812, but, owing to the gallant defense of the garrison at Fort

McHenry and other fortifications, was not captured. From the close of the War of 1812 to the beginning of the Civil War, the city grew steadily and became an important shipping port. The ships constructed here became famous throughout the world as the *Baltimore Clippers.* The Civil War was disastrous to the growth of the city, since connection with the South was cut off and nearly all of the commerce and manufactures were either crippled or suspended; but after 1865 Baltimore regained her former prosperity and grew rapidly. In February, 1904, a disastrous fire devastated nearly all of the business portion of the city, destroying over 1,500 buildings and nearly $80,000,000 worth of property. The burnt district has been rebuilt on a greatly improved plan, and notwithstanding the fire the city gained nearly 50,000 inhabitants in ten years.

BALTIMORE O'RIOLE, HANGBIRD, FIREBIRD, or **GOLDEN ROBIN,** one of the most beautiful of the birds that nest in Northern United States, a relative of the blackbird. It is about seven inches long, has a black head and upper parts and brilliant orange under parts. It weaves a long, graceful, pouchlike nest, usually far out on the tip of a high limb, where it is shaded by overhanging leaves. The Baltimore oriole is a courageous bird, and is quite able to protect its nest from much stronger and larger birds. Its song is sweet and clear, and this, with its bright colors and its destructiveness to insects, makes it a great favorite with every one. It is called the Baltimore oriole because black and orange were the colors of Lord Baltimore.

BALUCHISTAN, *ba lu chi stahn',* a small and unimportant country of Asia, about half as large as the state of Texas or the province of Alberta. Its southern boundary is the Arabian Sea, from which it ascends in steep shore lines. India is east, and politically Baluchistan is practically a part of that great empire, for it is a British dependency. Afghanistan is north, and Persia is west. The capital city is Khelat, where the khan exercises nominal authority.

The general surface of the country is rugged and mountainous, with some extensive intervals of barren, sandy deserts, and there is a general deficiency of water. Cotton, indigo and various fruits grow in several parts of the country. The date palm is abundant in the southwest. The country is almost entirely occupied by pastoral tribes under semi-independent sirdars or chiefs. Since the middle of the nineteenth century British commissioners have been appointed to the capital city, but up to 1876 the country was considered independent. The area in which British officials wholly administer affairs is 54,288 square miles, containing a population of 414,412 (1912). The area of the entire country is 134,638 square miles, and the total population is 834,703.

BALZAC, HONORÉ' DE (1799–1850), the greatest of French novelists, whose *Eugénie Grandet* is considered a masterpiece of character study. Some critics regard it as the world's finest novel. The author was educated for the law, but his inclinations were always toward literature, and from an early date he wrote novels. None of these had any particular merits, and only with the publication in 1829 of *The Chouans* did it become evident that the young writer was a man of genius. This genius he turned to the carrying out of a plan for representing in a series of novels, to be called *The Human Comedy,* all the phases of human life in the France of his day. The outcome of this ambitious plan was an astonishing number of novels, containing the marvelous delineations of character which entitled him to rank almost with Shakespeare in his power to portray men. That all sides of life might be presented, Balzac often introduced into his works accounts of most immoral and licentious characters and happenings, but with it all he does not neglect to lay stress upon the better and more ideal aspects of life. Aside from his *Eugénie Grandet* the best of his novels include *Cousine Bette, Lost Illusions* and *Poor Relations.* During the latter part of his life Balzac was much influenced by Madame Hanska, a Polish countess, whom he married only a few months before his death.

BALZAC

BAMBOO', a giant, treelike member of the grass family, possibly the most useful of any single plant in those parts of the world where it flourishes. It reaches its superb growth of from fifty to 125 feet in Japan,

the East Indies, the Philippine Islands, Southern Asia and in parts of Africa and South America. From the long, thick, creeping underground rootstalk, spring round, jointed stalks, which send out from their joints several shoots and one or two sharp, rigid spines. The oval leaves, eight or nine inches long, grow on short footstalks, and the flowers grow in large clusters from the joints of the stalk. Some stems grow to eight or ten inches in diameter and are so hard and durable as to be used for building purposes. The smaller stalks are used for fishing rods, walking sticks, flutes, and for innumerable other purposes.

Cottages are almost wholly made of bamboo; bridges, boxes, water pipes, ladders, fences, bows and arrows, spears, beds, couches, tables, stools, toys, baskets, mats, paper and masts for boats are but a few of the other uses to which it is put. The seeds of some species are also edible, and the young shoots are pickled and eaten. The

BAMBOO

bamboo is imported into Europe and America as a paper material, as well as for other purposes.

BANANA, *ba nah'na*, a tropical plant which bears one of the best known and most nourishing fruits used by mankind. Common as the banana is to-day, however, its export into America is a matter of comparatively recent date. Though the people of the United States and Canada consume about 50,000,000 bunches a year, the first shipment to New York was made the year after the close of the Civil War. At the present time the fruit is raised to a certain extent in California, Louisiana and Florida, but the bulk of the world's crop is produced in the West Indies and Central and South

BANANA TREE, FRUIT AND FLOWER
Flower grows at end of stem, beyond the fruit.

America, where the United Fruit Company has large and prosperous plantations, some of a hundred thousand acres each, under expert management.

The banana plant is really an herb with an underground stem, and the trunk, which is sometimes as high as thirty feet, is really not a trunk at all, but is formed by the closely compacted sheaths of the fallen leaves. These leaves, which grow to be six or ten feet long and one or more feet broad, have strong midribs from which veins are given off at right angles. The spikes of flowers grow nearly four feet long, in small bunches, covered by purple-colored bracts. The great cluster hangs down from the summit of the plant, and, as the bracts fall off one at a time, the flowers under each bract blossom with their faces toward the ground, but as the separate fruits begin to grow, they turn upward. A bunch of bananas in a store is hung bottom side up. The bananas are from four to ten or twelve inches long and one inch or more in diameter, and a bunch of them often weighs from forty to eighty pounds.

The fruit is remarkable for its high percentage of starch, and it is an agreeable and

nutritious food whether cooked or raw. Unripe raw bananas, however, are injurious, as they are very hard to digest. Banana flour, made by grinding the dried, unripened fruit, is gradually coming into use, and is said to have more nutriment, pound for pound, than wheat flour. The leaves of the

A BANANA LEAF

Sometimes the leaves of bananas grow to great length. The above illustration was drawn from a photograph taken in Central America.

banana plant are used in the tropics as a covering for the roofs of houses and in basket making. Recently a Brazilian invented a process of manufacturing a silk fabric from the plant fibers.

BANCROFT, George (1800–1891), an American historian, born at Worcester, Mass., author of one of the best American histories published. He was graduated from Harvard in 1817, studied history and philology in Germany and then traveled for some years in Europe. After returning to America he taught for a time, preached occasionally and in 1838 was made collector of customs at Boston. While lecturing on German literature Bancroft continued his literary labors and published (1841) *The History of the Colonization of the United States.* Later this work was embodied in his larger history of *The United States of North America.*

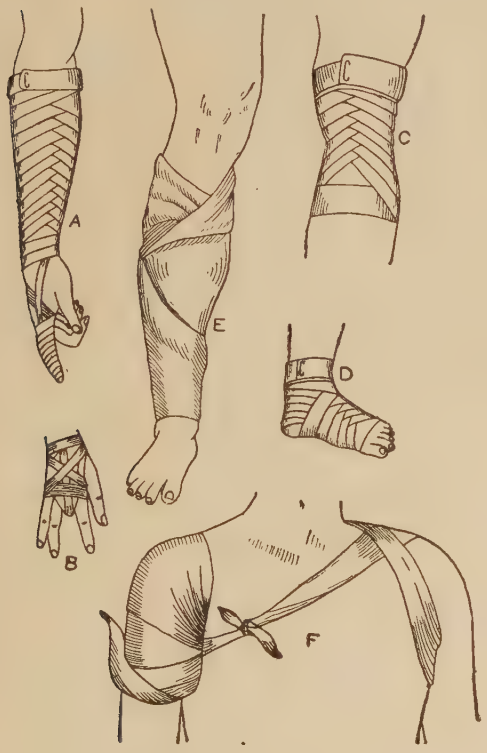
GEORGE BANCROFT

He was Secretary of the Navy under Polk (1845), aided in establishing the naval school at Annapolis, and from 1846 to 1849 was Minister to England. He published (1852) a *History of the Revolution in North America,* from material collected while in England. His oration in honor of Abraham Lincoln, delivered in 1866, is of historic value. Bancroft was minister to Prussia (1867), to the North German Confederation (1868), and in 1871 was sent as Ambassador to the German Empire. For many years he was an eminent contributor to *The North American Review.* While Secretary of the Navy he gave the order to take possession of California in case of war with Mexico. He was Secretary of War one month, and gave the order to march into Texas.

BANCROFT, Hubert Howe (1832–1918), an American historian, eminent authority on the pioneer history of the Pacific coast. He went to California in 1852 and engaged in the publishing business. Becoming deeply interested in the history of the Pacific coast regions, he collected a library relating to the subject and gave himself up to its classification and to original work on the subject. In 1875 he published in five volumes his work on *The Native Races of the Pacific States,* and in 1882 he published the first volume of his *History of the Pacific States.* Bancroft also wrote on the Spanish missions of California and the vigilance committees. In 1905 he presented a great collection of valuable historic material to the University of California.

BAND, the name given to a combination of musical instruments which are small enough to be carried by the players and therefore may be played upon the march. It is this characteristic which distinguishes a

band from an *orchestra;* the latter includes stringed instruments and others which are not portable and which must be played with performers seated. A band consists only of wind instruments and bass and snare drums. These wind instruments are chiefly the clarinet, piccolo, cornet, trombone, saxophone, baritone, bass horn and tuba. All these are described in this set of books.



BANDAGES
A, B, C and D, roller bandages.
E and F, triangular bandages.

The leading band master since the death of Patrick S. Gilmore (1829–1892) is doubtless John P. Sousa (which see). The largest band ever assembled was placed in control of Sousa in 1916—at the Great Lakes Naval Training Station, north of Chicago, Ill. It consisted of 350 pieces, and was so organized that it could be broken up into nearly twenty complete bands of ordinary size.

The most famous band of long standing in the United States is the United States Marine Band of Washington, for years under the direction of Sousa. Great English bands are those of the Royal Artillery and Royal Marine Band. For many years the Queen's Own Band of Toronto was a popular Canadian organization.

BAND'AGE, a surgical wrapper of some kind applied to a limb or other portion of the body to keep parts in position, exert a pressure, or for other purpose. Ordinary roller bandages are long strips of flannel, linen, cheesecloth or other soft fabric, from one to five or six inches in breadth and from twenty to thirty feet in length. The outer end is laid on the limb and the strip is wound smoothly around in a spiral so that each turn overlaps the previous one. Special bandages are required for special cases. In the drawing may be seen samples of several forms of bandages and particular ways of applying them.

BAN'DICOOT, the largest known species of rat, measuring about a foot in length. It

BANDICOOT

is a native of India and is very abundant in Ceylon. Its flesh is said to be delicate, resembling young pork, and is a favorite article of diet with the natives. It lives on grains and vegetables and is very destructive to rice fields and gardens.

The name is also given to a family of Australian marsupials which show characteristics of the kangaroo, the rabbit and the rat. These animals are sometimes called *native rabbits* by Australians.

BANFF, *banf,* Alberta, a Dominion government town, a famous health and pleasure resort, situated in Rocky Mountains Park, at an altitude of 4,500 feet. The scenery in the vicinity challenges that of the Swiss Alps for beauty. All utilities, most of them for the benefit of tourists, are operated by the government. The Canadian Pacific Railroad

provides transportation. The permanent population was about 800 in 1914, but about 300 men joined the expeditionary forces in France in the World War.

BANGALORE, *ban ga lor',* INDIA, a fortified town in the native state of Mysore, the principal military headquarters of the British in that district. Bangalore is an attractive town, with beautiful botanical gardens and imposing public buildings. It is an exceptionally healthful place because of its elevation, lying 3,000 feet above the sea. Of special interest are several European schools, including the Central College of the province, and the palace of the maharaja. Cotton cloths and woolens are manufactured in Bangalore. Population in 1911, 189,485.

BANG'KOK, the capital of the kingdom of Siam and its leading commercial city. It lies in a low region, on islands and on both banks of the Menam River, about twenty-five miles from the sea. Over a fourth of the people live in floating houses. That part of the town containing the royal palaces has fine residences, walks and drives. The older part of the town is surrounded by a high wall six miles in length. Bangkok is noted for the number and beauty of its Buddhist temples.

While much of the city's commerce is by water, there are now steam and electric lines. Most of the city is electric-lighted. The population in 1913 was 628,675; of these about 200,000 were Chinese, in whose hands centers much of the business of the town.

BANGOR, *ban'gawr,* ME., the county seat of Penobscot County, at the head of navigation on the Penobscot River, with a dock and water frontage of three miles. The foreign commerce of the city is over $12,000 a day, and the domestic trade is heavy. There are foundries, machine shops, and manufactories of paper, stoves, trunks, etc. The lumber trade is possibly the most important factor in the city's prosperity. The Bangor Theological Seminary (Congregational) was founded in 1816; the city also has the state university law school, the state insane asylum and the Eastern Maine general hospital. The city suffered from a severe fire in 1911; since then a new custom house and a new library have been built.

Bangor was first settled as Kenduskeag Plantation in 1769; from 1787 to 1791 it was known as Sunbury, since which time it has borne its present name. Population, 1910, 24,803; in 1917, 26,958 (Federal estimate).

BANGS, JOHN KENDRICK (1862–), an American editor and novelist, who is favorably known for his genial humor and breezy style. He is a native of Yonkers, N. Y. After graduating at Columbia College Bangs studied law, but soon turned to literature, and published his first story in 1886. Thereafter he wrote industriously, and was on the editorial staff of *Life, Harper's Magazine* and other periodicals. Since 1910 he has been a popular lecturer. His published works include *Tiddledywinks Tales, Three Weeks in Politics, Mr. Bonaparte of Corsica, The Bicyclers, A Houseboat on the Styx, Ghosts I Have Met, The Enchanted Typewriter, The Idiot at Home, Over the Plum Pudding, Foothills of Parnassus* and *From Pillar to Post* (1916).

BANGWEO'LO, the southernmost of the great lake reservoirs of the Congo, discovered by Livingstone in 1868. It is an oval-shaped, shallow sheet of water, said to be 150 miles in length from east to west and about seventy-five miles in width, but its exact limits are uncertain. Henry M. Stanley visited this lake in 1876, on his expedition across Africa. Its area is about 1,150 square miles. It has no commercial importance.

BAN'ISHMENT, a form of punishment by which the offender is sent out of his own country, or is abandoned to strangers or to his enemies. In modern times Russia, Turkey and some of the South American republics have resorted to banishment to punish political offenders; after the Russian revolution of 1917 thousands of Russians who had been banished to Siberia returned home. The French custom of sending criminals to a penal colony in French Guiana is a form of banishment. Though the United States has deported or excluded from the country undesirable aliens, the practice of sending away to other countries citizens who have transgressed the law has always been deemed unconstitutional.

BAN'JO, a five- to nine-stringed musical instrument, with a body like a tambourine and a neck like a guitar. It is played by stopping the strings with the fingers of the left hand and twitching or striking them with the fingers of the right. The banjo is a popular instrument with those who enjoy music in quick time, and is a special favorite among negroes.

BANK OF ENGLAND. See BANKS AND BANKING, subhead *Systems in England and France.*

BANK OF THE UNITED STATES. In the early period of American history Alexander Hamilton proposed that Congress should charter a special bank which should have power to issue national currency and be the financial agent of the United States. There were at that time only three banks in the United States, and their influence was local. Though there was very strong opposition to the plan, President Washington and Congress approved it, and the first Bank of the United States was chartered in 1791, in Philadelphia, for twenty years. The capital was $10,000,000; the government provided one-fifth of it. The bank established branches in numerous cities, issued paper money which was legal tender for all debts, and it easily dominated the financial field. When its charter expired there was too much opposition to secure a renewal, and its affairs were liquidated.

The War of 1812 disarranged finances throughout the country; many banks suspended payment in gold and silver, and paper money lost much of its value. A second United States Bank was demanded to stabilize finances, and it was chartered in 1816. Again the government was one-fifth owner, the capital being $35,000,000. It survived until the Presidency of Andrew Jackson; he fought it successfully, and in place of such a bank the present independent Treasury system was established, as a division of the government.

BANK'RUPT, any person or corporation unable to pay just debts, and whose property is taken by the state and administered or sold for the benefit of creditors. In the United States Congress has the power of legislating upon bankruptcy, and upon two occasions it has done so, the present federal statute being passed in 1898. Bankruptcy proceedings may be begun either by a debtor or his creditors, the former case being *voluntary bankruptcy*, the latter, *involuntary*. A man may be adjudged a bankrupt for (1) concealing or transferring goods in order to defraud creditors, (2) transferring goods in order to give certain creditors preference over others, (3) allowing a creditor to gain preference through legal proceedings, (4) making an assignment of his property to his creditors, (5) signing a statement of his inability to pay his debts. If he is adjudged a bankrupt, a trustee is appointed who has possession of all his property and divides it *pro rata* among his creditors. The bankrupt is thereupon discharged of all his debts.

In England a person while going through bankruptcy is disqualified for membership in Parliament, and he cannot vote for members of Parliament. There is no general law on bankruptcy in the Dominion of Canada, the matter being left to the provinces.

BANKS, SAVINGS. See SAVINGS BANKS.

BANKS AND BANKING. A bank is an institution organized for the two main purposes of receiving money from people for safe keeping as deposits and of loaning money on interest. That these are the only functions of a bank is the opinion of many uninformed persons; not a small proportion of these, realizing the power of money, assume the banker to be a power for evil in his community and accordingly they oppose banks.

As a matter of fact the local bank is the backbone of business in any community. It helps to maintain the business of merchant, farmer and artisan; it loans money for safe expansion of enterprises which could not prosper without temporary aid; it cares for the surplus savings of the community, does a great deal of work in receiving and paying out such money at no cost to such depositors, and is ready to advise the uninformed upon all matters relating to finance.

The service a bank renders locally in such matters as checks, notes, drafts, bills of exchange, etc., is explained in articles in these volumes bearing those titles.

In a nation-wide sense, many banks are empowered to issue money, but only under such safeguards as are imposed by the national government.

In the United States. There are two kinds of banks in every American state, and a third kind is yet permitted to do business in a few states.

Private Banks. These are institutions with small capital, organized and conducted as private businesses, with no state or government supervision. In most states banks are considered of so public a character and their operation so closely related to the general

welfare that private institutions, with their possibility for mismanagement are not allowed to exist.

State Banks. A state bank is one which is chartered by the state and is constantly under state supervision. Such a bank must follow strictly the banking laws of its state, and the institution is regularly examined by a state bank examiner.

National Banks. The national bank system was organized by a law passed in 1863. Under this act banks may be organized by five or more persons, authorized to issue notes for circulation by purchasing government bonds with their capital stock. At first the issue of notes was limited to ninety per cent of the face value of these bonds, but by an act of 1900 the banks were allowed to issue notes to the full amount of their bonds, or in excess of this amount, if gold or specie to cover the excess is deposited with the United States government. The minimum capital stock allowed was $25,000, for banks in towns having a population of three thousand or less. Strict supervision of all operations of the national banks is exercised by the government through a system of examiners, directed by the comptroller of the currency. Besides these there are many hundreds of state and private banks; in many states the latter are not subject to state examination.

LOCATION OF THE FEDERAL RESERVE BANKS AND THE DISTRICTS THEY SERVE

Currency Law of 1913. The national bank act of 1863 was framed to meet an emergency, that is, to create a market for United States bonds and to standardize and give uniform value to bank notes. It survived changing conditions for fifty years, but latterly it has been recognized that the system of note issue has grown so inflexible as to support inadequately the great business development of the country. The fundamental purposes of the new law are (1) to supply better control of bank reserves and (2) to provide a more flexible currency based upon commercial assets instead of government bonds. This currency is issued under the supervision of the federal reserve board, by the twelve *federal reserve banks* which were created under the terms of the act. The primary function of these banks is to rediscount commercial paper. For example, a retailer pays for goods which he has received from a wholesaler by giving his note. The wholesaler presents the note to a national bank, which pays it, less the interest or discount. The bank in turn presents the note to the reserve bank, which rediscounts it and pays for it with current funds or, if nece-

sary, by issuing *federal reserve notes.* In times of great demand for money, there will be a large supply of notes, if the demand is slack, the amount of the notes will be less. The national bank notes will be gradually retired.

There are twelve federal reserve banks. Their location and the districts which they serve are indicated on the accompanying map. Each national bank in the United States is required to subscribe to the stock of the reserve bank in its district. State banks may subscribe, but are not required to do so. Each national bank must invest 6 per cent of its capital and surplus in the stock of the reserve bank. The minimum capital of a reserve bank is fixed at $4,000,000. A reserve bank is a depository only for funds of its member banks, and, in the discretion of the secretary of the treasury, of government funds. Besides acting as a reserve bank, it may buy and sell certain classes of commercial paper, both at home and abroad. Each reserve bank will be managed by a board of nine directors, three of whom will be bankers named by the member banks of the district. Three of the other members will be citizens, not bankers, also chosen by the banks, and the remaining three directors will be appointed by the federal reserve board at Washington. The *federal reserve board,* which is the body in supreme control of this new system, is composed of the secretary of the treasury and the comptroller of the currency, as ex-officio members, and five other members appointed by the president for ten-year terms at an annual salary of $12,000.

The currency law of 1913 greatly extends the legitimate field for national banks. The peculiar needs of farming are recognized; federal reserve banks may discount ordinary commercial paper for ninety days, but commercial paper issued for agricultural purposes may be discounted for six months. National banks outside the reserve cities are also allowed to buy first mortgages on farms for periods not longer than five years. The law also provides, for the first time, for foreign trade. With the approval of the federal reserve board any national bank with a capital and surplus of $1,000,000 may establish foreign branches. These extensions of the privileges of national banks are almost equally noteworthy with the main purpose of making the currency system more flexible.

At the end of the fiscal year 1918 there were in the United States 7,579 national banks with a capital of $1,066,208,875. At the same time there were 19,934 state banks.

Systems in England and France. The systems of banking which exist in different countries, though agreeing in general principle according to time-honored customs, differ in details. In England the most important banking institution is the Bank of England, which was incorporated in 1694 as a joint-stock association, with a capital of £1,200,000. It loaned its entire capital to the government and received the right to issue notes for circulation, and also was given a monopoly of the banking business of the country, with the privilege of establishing branch banks. Gradually the charter has been amended and extended until the present capital of the bank, to the extent of which it is allowed to issue bills of circulation, is £15,750,000. All its notes are redeemable in gold and therefore pass freely at par anywhere in the world. It holds deposits amounting to more than $225,000,000, has outstanding loans of nearly $170,000,000, and by reason of its many branches and sound basis is the most influential financial institution in the world.

The Bank of France was established in 1800, upon a basis similar to that of the Bank of England. It has the sole right to issue paper money in France, and its notes are issued upon such excellent security that they pass as readily as do those of the Bank of England. It has often come to the aid of the government in time of need, and in 1890, when the London money market was undergoing a severe strain, the Bank of France relieved the situation there and throughout the world by advancing a large sum in gold.

The banking systems of other European countries are similar to that of France.

Early History. Banking has existed since the earliest times, but the first banks were really only money exchanges. The first bank whose history can be traced was the Bank of Venice, established in 1171 and continuing almost until the nineteenth century. By the end of the sixteenth century banks were flourishing in nearly every large city of Europe, most of them being founded for the same purpose as the Bank of Venice. Gradually they assumed other functions, such as receiving deposits. The present check and draft system originated about the begin-

ning of the seventeenth century. Finally, banks began to pay depositors for the use of funds, and in this was the origin of the interest upon savings accounts.

The first bank chartered in the United States was opened in 1780 under an act of Congress but was rechartered by Pennsylvania in the following year, owing to opposition to the policy of government control of finances. The first really *national* bank was organized in 1791, with a capital of $10,000,000, the government retaining the right to subscribe one-fifth of this amount. Its charter was limited to twenty years. The headquarters of the bank were at Philadelphia, but it established branches in several other cities. At the expiration of its charter the opposition of local and state banks had become so influential that the charter was not reissued. Disastrous financial conditions followed, and as a result another United States Bank was chartered under President Madison in 1816, its capital being $35,000,000, of which the government subscribed $7,000,000, and individual citizens took the remainder. This charter was also limited to twenty years. During its existence it did valuable service in maintaining a fairly uniform currency and in facilitating exchanges through its branches in different parts of the country. But under President Jackson the demands of rival institutions for its destruction were heeded, and though Congress rechartered the bank in 1831, the act was vetoed by President Jackson. Under Van Buren a sub-treasury or independent treasury system was substituted, and until the establishment of the present national banking system, it proved an efficient means of regulating the currency and providing for the financial needs of the country. Under this system the funds of the government were deposited in government vaults in various cities, where they were kept until used by order of the executive department of the United States. Thus, the government was entirely separated from the banking business, except at times when the unusual demands upon the banks could not be met by them, when government funds were released to relieve the situation. Since the Civil War, however, though the subtreasuries are still in existence, the principle of complete separation of the government and the banks has been abandoned, government funds being deposited in many of the national banks.

Canadian Banks. Previous to 1817 several attempts to organize banks in Canada met with failure because the home government refused charters. In the year named several citizens of Montreal organized a private institution, which later developed into the powerful Bank of Montreal. With this beginning other banks learned how to organize among the colonies.

In 1867, upon Confederation, all banks were placed under control of the Dominion government. Laws passed in 1870 and 1871 placed banking upon a solid and conservative basis; banks were authorized for ten-year charters, and there was a provision that laws relating to banks should be revised every twenty years, to keep pace with the growing demands of the country. The last revision was in 1913, effective until 1923.

To secure a charter a bank must have a capital of $500,000, one-half to be paid in before the charter is issued. No man can be a bank director whose holding is less than three per cent of the stock. There is a double liability upon stockholders in case of bank failure—they may be assessed twice the amount of their stock. The requirement of large capital makes the establishment of independent banks in small towns almost impossible; therefore strong city banks have located over 3,000 branches throughout the Dominion. See MONEY, IN CANADA.

Related Articles. Consult the following titles for additional information:

Bill of Exchange	Currency
Check	Draft
Clearing House	Note

BAN'NOCKBURN, a village in Scotland on the Bannock rivulet, three miles southeast of Stirling. Here was fought, in 1314, the great battle by which Robert Bruce, through his victory over Edward II, won independence for Scotland. Robert Burns has celebrated this victory by a poem in which Robert Bruce is supposed to be addressing his soldiers before the battle. It begins:

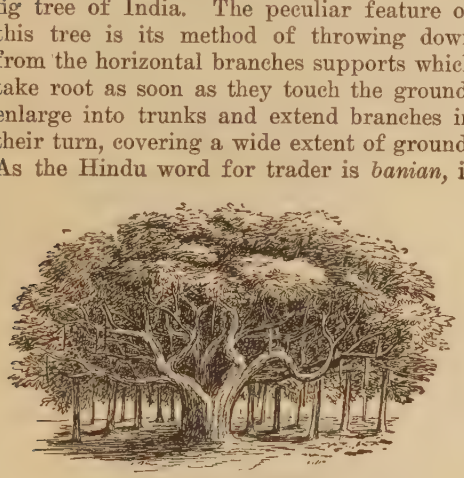
Scots, wha hae wi' Wallace bled;
Scots, wham Bruce has aften led;
Welcome to your gory bed,
Or to glorious victorie!

BANNS OF MARRIAGE, an announcement, publicly made, of the intended marriage of a man and a woman. Banns of marriage are usually read in a church a few Sundays before the ceremony. The custom originated in the Roman Catholic Church in the Middle Ages, and its purpose was to pro-

tect young people from unsuitable unions, for it was the privilege of anyone who heard the banns read to make known any objections he might have to the proposed marriage. Banns are still read in Roman Catholic and English churches.

BANTU, *bahn'too,* the general name of a group of African races, including, among others, the Kaffirs, Zulus and Bechuanas, but not the Hottentots. See AFRICA.

BAN'YAN, or **BAN'IAN**, a remarkable fig tree of India. The peculiar feature of this tree is its method of throwing down from the horizontal branches supports which take root as soon as they touch the ground, enlarge into trunks and extend branches in their turn, covering a wide extent of ground. As the Hindu word for trader is *banian,* it



BANYAN TREE

is probable that the tree is so called because the Hindu merchants frequently spread their goods in the shade of these tree-forests. Banyan wood is soft and porous, and from its white, sticky juice birdlime is sometimes prepared. One of the largest banyan trees known to exist is on the island of Ceylon. It has 350 major trunks and over 3,000 lesser ones.

BAP'TISM, a rite which is generally thought to have been administered to proselytes by the Jews, even before Christ. From this baptism, however, that of Saint John the Baptist differed, because he baptized Jews, also, as a symbol of the necessity of perfect purification from sin. Christ himself never baptized, but directed his disciples to administer this rite to converts (*Matt.* XXVIII, 19); and baptism, therefore, became a religious ceremony among Christians, taking rank as a sacrament with all sects which acknowledge sacraments. In the primitive Church the person to be baptized was dipped in a river or in a vessel, with the words which Christ had ordered, and was given a new name to express the complete change. Sprinkling, or, as it was termed, *clinic* baptism, was used only in the case of the sick who could not leave their beds.

The Greek Church and Eastern schismatics retained the custom of immersion; but the Western Church adopted or allowed pouring or sprinkling, which has since been continued by most Protestants. Since the Reformation there have been various Protestant sects called Baptists, holding that baptism should be administered only by immersion, and to those who can make a personal confession of faith. Different Churches have adopted various customs in connection with baptism The Greek, Reformed and Roman Churches baptize infants. The Church of England makes the sign of the cross on the forehead of the candidate. Some churches formerly anointed with oil to signify the gift of the Holy Spirit, or breathed upon the candidate to drive out the devil.

BAP'TISTS, a Protestant sect distinguished by its opinions respecting the mode and subjects of baptism. The name was first applied in 1644 to English congregations who taught that the only true method of baptism is by immersion. The first Baptist church in America was founded at Providence, R. I., in 1639 by Roger Williams. At the present time there are fifteen different Baptist bodies in the United States and its possessions, with a total membership of over 7,240,000 and nearly 59,000 churches. In Canada there are about 390,000 Baptists.

BAPTIST YOUNG PEOPLE'S UNION, THE, of America, was organized July 7, 1891, as a federation of all Baptist young people, without regard to name or organization. Its purpose is to bring all such persons together in a common interest and sympathy in work, to develop Christian character, to increase Scriptural knowledge and to impart a wider missionary outlook. The association is represented by branch societies in every American state and province of Canada. The headquarters are at Chicago.

BARBADOS, *bahr ba'doze,* the most easterly of the West India Islands, situated seventy-eight miles east of Saint Vincent. It has been a British possession since 1625, and in 1752 was visited by George Washington and his invalid brother Lawrence. The soil in the lowlands is very fertile, and large crops of sugar cane are raised. Other important products are cotton, coffee, tobacco, indigo and arrowroot. The leading indus-

tries are the manufacture of sugar and rum, but the island has considerable commerce and important fisheries. Barbados is the headquarters for the English forces in the West Indies. It is under a governor, assisted by an executive committee and a legislative council, all appointed by the king, and a house of assembly elected by the people. Bridgetown is the capital. The island has railroad and telephone lines, and good schools. Population, 1911, 171,982.

BAR'BARA, SAINT, according to the legend, a saint of Nicomedia, in Asia Minor, who was beheaded by her father for having accepted Christianity. Her father immediately thereafter was struck dead by lightning. Saint Barbara is invoked in storms, and is considered the patron saint of artillerists. Her day is the fourth of December.

BARBA'RIAN, a name given by the Greeks to every one who spoke any language but Greek. Originally, it had no unpleasant significance, but naturally, because the Greeks invariably regarded themselves as superior intellectually to any other people, it soon took on something of the modern meaning—rude, uncivilized and illiterate. The Greeks, of course, applied the term to the Romans, who in turn made use of it to designate all who differed from themselves in language and civilization.

BARBAROS'SA, a surname given to Frederick I of Germany. It means *Redbeard.* See FREDERICK I.

BAR'BARY, a general name for the most northerly portion of Africa, comprising Morocco, Fez, Algeria, Tunis and Tripoli, including Barca and Fezzan. These are now controlled largely by European nations. The principal races are the Berbers, the original inhabitants, from whom the country takes its name; the Arabs, who conquered an extensive portion of it during the times of the caliphs; the Bedouins, Jews, Turks and French colonists of Algeria. The country, which was prosperous under the Carthaginians, was, next to Egypt, the richest of the Roman provinces, and the Italian states enriched themselves by their intercourse with it. In the fifteenth century, however, it became infested with adventurers, who made the name of Barbary a terror to commerce. In 1815 a United States squadron, under Commodore Decatur, was sent to exterminate piracy among the Barbary powers, and never again was American commerce threatened. At various times the European nations suffered, however, until

BARBARY PIRATE SHIP

the evil was finally removed by French occupation of Algiers.

BAR'BECUE, a word of uncertain origin, applied to the practice of roasting whole a hog or other large animal. In the Southern states the word has been extended to signify any open air festivity where animals are roasted whole and great quantities of food and drink are provided.

BAR'BEL, a genus of fresh-water fishes of the carp family, distinguished by the four fleshy appendages growing from the lips,

BARBEL

two at the nose and one at each corner of the mouth, forming the kind of beard to which the genus owes its name. The barbel is common in European rivers and reaches a weight of twenty pounds. It gives good sport to the angler, but its flesh is very coarse.

BAR'BER, a man who has learned the trade of cutting hair, trimming beards and removing hair on the face with a razor. In some large cities women have entered this business, but their presence is resented by male members of the craft and not approved by society. Centuries ago the crude practice

of surgery was included in the work of the barber, but by the time of Henry VIII surgery by barbers was limited to the operation of blood-letting and tooth-drawing. The sign of the old profession—the pole which the patient grasped, with its spiral decoration in imitation of a bandage—is still retained.

Barber's Itch, a disease that affects the faces of men, and is so-called because it is often communicated by the implements of the barber shop. It is caused by a parasitic fungus that finds its way into the hair follicles and causes a scarlet eruption, which spreads over the face and is accompanied by severe itching and burning. The disease may be readily cured by killing the parasite.

(a) Japanese barberry, harmless; (b) common barberry.

BARBERRY PLANTS

BAR'BERRY, a common shrub, bearing bunches of small, beautiful, nearly oval, red berries. The leaves are serrated and pointed, and thorns, three together, grow upon the branches, with the hanging clusters of yellow flowers. A curious fact about these flowers is that the stamens are held away from the pistils by a fold in the corolla till they are released by the wind or by a passing insect. Then they fly forward and snap their pollen on the stigma. The berries are sour, but when boiled with sugar they make an agreeable preserve or jelly. They are also used as a dry sweetmeat, in sugar plums or comfits they are pickled with vinegar, and they are used for the garnishing of dishes. The inner bark and roots mixed with alum yield a fine yellow dye.

Though the common barberry makes an attractive ornamental shrub, its presence in wheat-growing regions is a menace, because a fungus, exceedingly injurious to wheat, often develops on the underside of the leaves. In 1916 this fungus reduced the American wheat crop by 2,000,000 bushels, and in 1918, when the food situation was a vital factor in the war situation, residents in the Mississippi Valley were urged to destroy their barberry bushes as a patriotic duty. Only the tall variety becomes infected; the short Japanese barberry is harmless.

BARBIZON' PAINTERS, a group of French nature painters who lived in the Barbizon region, near the forest of Fontainebleau. Their styles of painting has been admirably reproduced in America by George Inness (which see). Their fundamental ideas were that every picture should be painted from nature itself, and should express the artist's individual feeling. Representative of the group were Rousseau, Corot, Daubigny, Troyon and Millet. (A detailed study of Millet's work will be found in the article PAINTING.)

BARCELONA, *bahr se lo'nah*, SPAIN, the second largest city in the country, ranking next to Madrid, and the principal maritime and industrial center. Formerly the capital of the kingdom of Catalonia, it is now the seat of government of the province of Barcelona. The city is situated on the northern Mediterranean coast, 440 miles by rail northeast of Madrid. It consists of the old town, whose ancient walls have been transformed into promenades, and numerous suburbs containing modern homes and manufacturing

establishments. In the center of the old town stands a fine cathedral. As a cotton-manufacturing city Barcelona is among those of first rank in Spain, and it also produces woolen and silk fabrics, metal goods, glass, leather and chemicals. In normal times ships of an aggregate tonnage of 3,000,000 enter and clear the harbor every year. The city has many churches, monasteries and nunneries, and is the seat of a supreme court and a university. There are in addition excellent art galleries, libraries and theaters. A feature of special interest is an enormous bull ring seating 14,500 people. Population, 1910, including suburbs, 587,411.

BARD, among the ancient Celtic tribes a wandering poet whose occupation was to compose and sing verses in honor of the heroic achievements of princes and brave men, generally to the accompaniment of the harp. The bards of Gaul were known to the Romans two centuries before Christ, but only the tradition of their popularity survives. The first Welsh bards of whose work anything remains, lived in the sixth century, and from that date until the tenth century little is heard of the bards. Edward I of England is said to have hanged all the Welsh bards as promoters of sedition, and on this event is based Gray's ode, *The Bard.* For the preservation of the remains of the ancient Welsh literature, the Cambrian Society was formed in 1818.

BARE'BONES PAR'LIAMENT, the name given to the parliament assembled by Cromwell in 1653, because one of its prominent members bore the name Praise-God Barebones.

BAREILLY, *ba ra'le,* or **BARELI**, the capital of the Bareli district in India, in the United Provinces, 150 miles northeast of Delhi. It has a well-attended government college, and there is a strong military post. The city is growing in commercial importance, the commerce in cotton, grain and sugar being particularly encouraging. Some of the scenes connected with the Sepoy Rebellion (which see) occurred here. Population, 1911, 129,462.

BAR HARBOR, ME., a village on Mount Desert Island (now Lafayette National Park), the largest of the many islands off the south coast of the state. The town has about 2,000 permanent population, but a large number of people visit the place every summer and occupy summer homes. Until 1916 automobiles were not permitted on the island. Mount Desert is hilly, some peaks rising nearly 1,000 feet.

BARI, *bah're,* a seaport in South Italy, on a small promontory on the Adriatic, capital of the province Bari delle Puglie. It was a place of importance as early as the third century B. C., and has been thrice destroyed and rebuilt. The present town has a large Norman castle, a fine cathedral, handsome public squares and good schools. The chief manufactures include cotton and woolen goods, hats, soap, glass and liquors. Population, 1915, estimated, 109,218.

BA'RIUM, a metal, found in nature only in compounds, such as the common sulphate and carbonate. Barium was isolated by Davy for the first time in 1808. It is a yellow, malleable metal, which readily oxidizes, decomposes water and fuses at a low temperature.

Barium Products. Following are some of the products of barium, and their uses:

Barium peroxide is used in the times of peace for the manufacture of hydrogen peroxide and as a bleach, especially in the straw hat and blanket industries.

Barium sulphate (precipitated) is used in the manufacture of automobile tires, in the paper industry and in making printers' ink.

Barium carbonate has such widely diversified uses as in the manufacture of rat poison, in the manufacture of high-grade optical glass, etc.

Barium chloride is largely used in the dye industry and is absolutely necessary in the manufacture of photographic materials.

Barium hydrate finds its largest use in the beet-sugar industry.

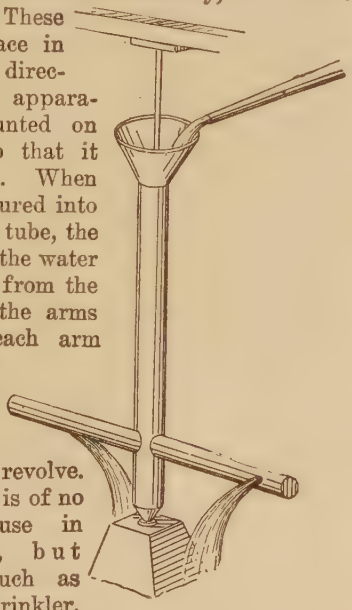
Barium nitrate enters into the manufacture of fireworks, detonators, railroad signals and into munition making.

BARK, the exterior covering of the stems of exogenous plants, meaning those which grow from or on the outside. It is composed of several layers and is separable from the wood. The outside layer is heavy, rough or corky, and usually dead. The innermost layer conveys the foods, and the intermediate green zone has chlorophyll, or the green coloring matter found in plants, and this manufactures starch here in the same way that it does in the leaves. The outer and inner zones of bark may increase in thickness, but the green layer remains about the same, supplying cells to the outer layer and taking them to the woody interior. The rough and tattered appearance of the barks of some trees is owing to the growth of the

interior and to the warping which comes from constant wetting and drying.

Many plants produce bark that is valuable in commerce. Cork is gathered from the outer layer of the bark of certain oak trees; tannic acid, the substance which is valuable in tanning leather, is obtained from the bark of hemlock and other trees; quinine is made from Peruvian bark, and the bark fibers of hemp, flax and other plants are made into threads, ropes, mats and cloths.

BARK'ER'S MILL, a device for illustrating the principle of reaction of forces (see DYNAMICS). It consists of a vertical tube having two horizontal arms attached near the lower end. On one side of each of these arms, near its outer extremity, is a small opening. These openings face in opposite directions. The apparatus is mounted on a frame so that it can rotate. When water is poured into the vertical tube, the reaction of the water jet rushing from the orifices in the arms causes each arm to move backward and thus makes the apparatus revolve. This device is of no practical use in laboratories, but machines such as the lawn sprinkler, operated on the same principle, are common.



BARKER'S MILL

BAR'LEY, one of the oldest and hardiest of the cereal grains. In general appearance and manner of growth it resembles wheat, but it has a wider range of latitude than that grain. Barley can be grown farther north than any other cereal, for it will mature in Alaska, Norway and Iceland; it is also cultivated in India, North Africa and other countries in the southern hemisphere. It has been known and cultivated from the earliest times; beer was made from it by the Egyptians. The chief species are two-rowed barley, four-rowed barley, and six-rowed barley, of which the small variety is the sacred barley of the ancients. *Scotch barley* is the grain deprived of the husk in a mill. *Pearled barley* is the grain polished and rounded and deprived of the husk and other coverings.

Barley is one of the chief grains used in malting (see BEER; BREWING). It has long been used in Europe as a bread grain, and it is also a common ration there for horses, cattle and pigs. In America, however, barley has not, until recently, been used to any extent as a human food. It was the food situation caused by the World War and the need of conserving wheat that brought barley into prominence in America. The United States Food Administration in 1917 tested a number of recipes calling for barley meal or flour, and recommended the use of the grain in making barley bread, barley and rolled oats muffins, barley and corn flour muffins, steamed barley pudding, barley flour spice cake, etc. Barley has a high starch content and is very nutritious. It is utilized for thickening soups, and barley water, prepared from the grain, is a common remedy for infant intestinal disorders.

About one-eighth of the world's supply of this grain is produced in the United States, where the annual crop ranges from about 209,000,000 bushels to over 223,800,000 bushels. California, Minnesota, North Dakota, Wisconsin and South Dakota are important barley states. The crop in Canada is between 45,000,000 and 51,000,000 bushels a year. Russia, Germany and Austria-Hungary are the most important European countries producing barley, but England produces the best quality of malting barley.

BARMECIDE'S, FEAST, *bahr'me sydz*, a phrase proverbially used for a feast on imaginary dainties. It had its origin in the story of the barber's sixth brother, in the *Arabian Nights*. In this narrative the hungry brother of the barber is invited to dine with a prince of the Barmecide family. The guest sits down to empty dishes, while the host makes merry by asking his opinion of the food. Not to be outdone, the hungry guest commends everything highly, especially the wine, which he says has gone to his head. Pretending to be intoxicated, he slaps his host on the ear. Then the Barmecide prince, amused at the way the tables are turned on him, orders a real feast set before the beggar.

BAR'MEN, a city of Germany, situated on the Wupper River, 25 miles northeast of Cologne. The town is made up of several

small villages, now joined together extending along the valley, and on its western boundary it forms a continuation of the town of Elberfeld. The river flows through the center of the town. There are a number of charitable, benevolent and educational institutions, a municipal hospital, a museum of natural history, a library and an art gallery. The chief industry is the manufacture of ribbon, in which Barmen is the leading city of the Continent. Other manufactures are cotton and woolen fabric, linens, silks, laces, soap, candles, machinery and musical instruments. The location and industries of Barmen make it an important commercial center. The town dates from the eleventh century, and was joined to Prussia in 1815. Population, 1910, 169,201.

BAR'NABAS, the surname given by the disciples to Joseph, a fellow laborer of Paul, who, like Paul was ranked as an apostle. He worked with Paul in establishing a Christian community at Antioch, where the followers of Christ were first called Christians. Tradition says he was martyred at Cyprus.

BAR'NACLE, the name of a family of marine crustaceans, or water-breathing animals, having a crustlike shell or scab enclosing them. This mantle or shell is composed of five principal valves and several smaller pieces, joined together by a membrane attached to their circumference; and they are furnished with a long, flexible, fleshy stalk, provided with muscles, by which they attach themselves to ships' bottoms, submerged timber, rocks and the like. One species, the *acorn barnacle,* has no stalk, but has a hard, acorn-shaped shell of many leaf-shaped valves. The structure of the barnacle can best be seen in the *goose barnacle.* It has a leathery stalk and six pairs of jointed feet. At the base of the shell is a cement-gland containing a secretion which enables the barnacle to adhere to any substance. These forms are widely distributed and are common in salt waters everywhere; they are not found in fresh water. Barnacles feed on small marine animals brought within their reach by the water and secured by their tentacles. Some of the larger species are edible. According to an old fable, these animals produced barnacle geese. See BARNACLE GOOSE.

BARNACLES

BARNACLE GOOSE, a wild goose common in Europe as a summer visitant in the North Sea. Its forehead and cheeks are white and the upper body and neck black. It takes its name from an old superstition that it was produced from the barnacles that grow on rocks.

BARNARD, GEORGE GREY (1863–), an American sculptor whose work has been compared to that of the English painter Watts because of its symbolic and idealistic character. His sculptures are admired equally for their originality and their excellence of workmanship. Barnard was born at Bellefonte, Pa. He studied at the Chicago Art Institute and the School of Fine Arts in Paris, and was a recipient of gold medals at the Paris Exposition of 1900 and the Pan-American Exposition in 1901. In 1904 he produced one of his greatest works—two figures typifying the idea *I Feel Two Natures Struggling Within Me* (Metropolitan Museum). Other sculptures of importance include *Sleeping Boy, Maidenhood,* the bronze *God Pan,* on Columbia University campus, the sculpture for the state capitol of Pennsylvania, and a statue of Lincoln for the city of Cincinnati. The latter, a colossal figure in bronze, occasioned a heated controversy both in America and in England, where, in 1917, it was proposed to erect a duplicate. The statue was condemned by some critics as a monstrous figure that merely emphasized Lincoln's physical defects, and by others it was warmly praised as "immortalizing Lincoln for all time."

BARNARD, HENRY (1811–1900), an American educator, organizer of the Bureau of Education, and the first man to hold the position of United States Commissioner of Education. He was born at Hartford, Conn., and became prominently identified with educational work while he was a member of the legislature of this native state. At that time he was successful in securing the reorganization of the public school system of the state and in introducing many improvements. He was afterwards made state school commissioner and in 1856 founded the *American Journal of Education*. Barnard began his work for the United States government in 1867, and during his years of service he laid the foundations for the American public-school system as it is organized to-day.

BARNARD COLLEGE, of Columbia University, was organized in 1889 as an undergraduate college for women. It was named for President Barnard of Columbia, who had endeavored unsuccessfully to put the institution on a coeducational basis. In 1902 the college received an endowment of $500,000, half of which was the gift of John D. Rockefeller. Additional gifts subsequently increased the fund to about $1,300,000. The institution has prospered, and has a student enrollment of about 800. It has its own board of trustees and a faculty numbering about 115. The buildings are on Broadway, adjoining those of Columbia.

Frederick Augustus Porter Barnard (1809–1889), for whom Barnard College was named, was born at Sheffield, Mass., and educated at Yale College. He began his career as a teacher of the deaf and dumb, but was soon chosen professor of natural philosophy and mathematics in the University of Alabama. In 1856 he was elected president of the University of Mississippi and in 1864 became president of Columbia College (now Columbia University), holding this position for twenty-four years. He was United States commissioner to the Paris Exposition in 1867 and was also associated with numerous astronomical projects and with the United States Coast Survey, being chosen in 1863 to superintend the publication of the maps and charts of that organization. At his death he left most of his property to Columbia College.

BARN'BURNERS, the name given in American history, to a faction of the Democratic party in New York state, so called from their radical tendencies, in allusion to the story of the Dutchman who burned down his barn to clear it from rats. The division of the party was in 1844, the followers of Van Buren being termed *Barnburners*, and those of Polk, *Hunkers*. In 1848, after a contest in the Democratic National Convention, the former joined the Free-soilers and voted for Van Buren, and thus made possible the election of Taylor, the Whig candidate. The Democrats were practically reunited in 1852. See DEMOCRATIC PARTY.

BARNUM, PHINEAS TAYLOR (1810–1891), an American showman whose varied career represents a mixture of audacity, shrewdness and luck. Barnum was born at Bethel, Conn., where, as a boy, he played jokes on people who came into his father's tavern. Later he experimented with the lottery business, marriage and newspaper editing.

In 1834 Barnum removed to New York, where he entered upon his first venture as a showman, buying Joyce Heth, the reputed nurse of General Washington, and exhibiting her with considerable profit. In 1841 he bought Scudder's American Museum in New York, through which he became at once prosperous by exhibiting various fraudulent freaks and curios, and also a noted dwarf (Charles S. Stratton of Bridgeport), whom he styled Gen. Tom Thumb and exhibited in Europe in 1844. In 1847 he offered Jenny Lind $1,000 a night for 150 nights, and received $700,000—the concert tickets often being sold at auction.

P. T. BARNUM

After a period of bankruptcy he entered upon new enterprises and made another fortune. In 1866 he was a candidate for a seat in Congress, but was unsuccessful. In 1868 he relinquished the business of showman, resuming it, however, in 1871, when he organized a traveling museum, menagerie and circus, known as the "Greatest Show on Earth," which required 500 men and horses and 100 railroad cars to transport it. In 1879 Barnum estimated the number of his patrons up to date as 90,000,000. He paid $10,000 to the London Zoölogical society for

the huge elephant, "Jumbo," which gained about as much notoriety as its owner. Barnum published several books, including an autobiography, which tells frankly of many of his audacious frauds. His principle was to create a public demand by advertising, then to satisfy it, either in truth or by fraud. He once said, "The American people like to be humbugged."

BARO'DA, BRITISH INDIA, a fortified city of the district Gujaret and the native state Baroda, of both of which it is the capital. Baroda is 248 miles north of Bombay. It is a railroad center between the interior and the coast, and has a prosperous trade in grain, flax, cotton and tobacco produce. There are several fine buildings and educational institutions. Population, 1911, 99,345.

BAROMETER, an instrument for measuring the pressure of the atmosphere, based on an experiment performed in 1643 by Torricelli, a pupil of Galileo. He took a glass tube closed at one end, filled it with mercury and inverted it in a basin of the same liquid (see illustration). As a result the liquid in the tube fell until its top was about thirty inches above the surface of the liquid in the basin. That occurred because the fluid in the air-tight tube was pushed up by that in the basin, which was under atmospheric pressure.

THEORY OF THE BAROMETER

Fill a glass tube (over thirty inches long and closed at one end) with mercury. The column in the tube will fall until it is only about thirty inches long. The normal pressure of the air on the contents of the bowl balances the weight of the mercury in the tube.

At sea level, under ordinary conditions, the atmosphere will sustain a column of mercury thirty inches high, and this column is equal in weight to a column of atmosphere having the same area and extending from the earth as far as the atmosphere reaches. Since the atmospheric pressure lessens as altitude increases and the column of mercury gradually lowers in ascending from sea level, a barometer is frequently used to mark the altitude of different localities. The most common use of the barometer, however, is in foretelling the weather. There are mercurial barometers in all stations of the United States Weather Bureau, for this purpose. Since a change of weather follows a change of atmospheric pressure, the rise or fall of mercury in the barometer enables one to foretell in a measure what changes to expect. In making this forecast, one may be guided by the following laws:

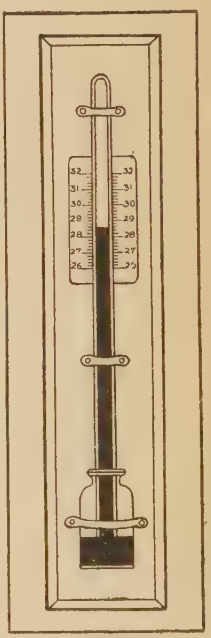
(1) A rising barometer indicates the approach of fair weather.

(2) A gradually falling barometer indicates the approach of foul weather.

(3) A sudden fall of the barometer indicates the approach of a storm.

(4) A high, unchanging barometer indicates settled fair weather.

How to Make a Barometer. The necessary parts are a glass tube $\frac{1}{8}$ inch internal diameter and about 34 inches long, a bottle 1 inch inside diameter and 2 inches high. Seal one end of the tube by holding it in the flame of a gas burner till the glass is so soft that it can be pinched together with pliers. Put a little paraffin in the bottle and melt it by holding over a small flame. When cool, the paraffin should cover the bottom to a depth of $\frac{1}{16}$ inch.' The tube should now be filled with mercury, which should be "redistilled" — in other words, there must be no air bubbles separating the particles of mercury. In filling care must be taken to see that the mercury completely fills the tube. The glass bottle containing the wax covered bottom is now placed over the end of the tube and pressed firmly to insure an air-tight fit. The bottle and tube should now be inverted. After a few ounces of mercury have been poured into the bottle, the tube may be raised out of the wax, but the edge of the tube must not be brought above the surface of the mercury in the bottle.

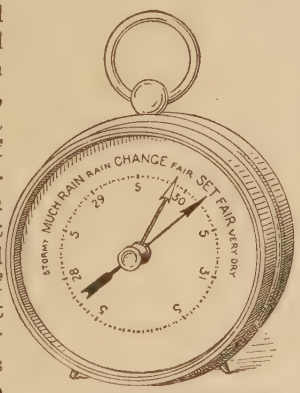


BAROMETER

The instrument should be laid aside while the base is being made, or, if you prefer, make the base first, so that it will be ready. Cut a wooden base 3 inches wide, 40 inches long, about ⅞ inch thick. Chisel a groove lengthwise to fit the tube; and at the bottom deepen and widen it, so that one-half of the diameter of the bottle rests below the surface of the board. Brass strips, or leather, if brass ones are not available, should be used to secure the tube and bottle to the base. After the instrument is in place put enough mercury in the bottle so the depth of the mercury above the bottom end of the tube will be about ½ inch.

Make the scale on a strip of cardboard 2 inches wide. Mark off 6 inches, divide them into sixteenths, and number from 26 to 32. The scale should be fastened to the base with glue or tacks, either beside or behind the tube, preferably the latter because readings can be more easily taken. Before fastening the scale compare the instrument with a standard barometer and adjust the scale so that the readings are the same.

Aneroid Barometer. This consists of a flat, circular metallic box, as illustrated. Within the box is a system of wheel work connected with a needle, which passes over a dial, like the hands of a watch. One side of the box is constructed of such light material that it bends inward with the pressure of the atmosphere, but it is sufficiently elastic to resume its former position when this pressure is removed or to tend to resume this position as the pressure is lessened. When the barometer is completed the air is exhausted from it and it is then sealed. The motion on the flexible side caused by the variation of pressure moves the needle backward and forward over the dial. When carefully constructed the aneroid is very accurate and it is convenient in measuring altitudes, since it can be carried from place to place with ease and the changes can be read by noting the movements of the needle over the dial.



ANEROID BAROMETER

BAR'ON, the title held by an English nobleman of the lowest grade. It was brought into England in 1066 by the Normans, and was applied to those who received land grants from the king as a reward for military service. A distinction was made between the greater and lesser barons, according to the extent of their holdings. In course of time the land grants became hereditary and the lesser barons became retainers of the greater barons, who became dukes or earls. The king now confers the title baron on men of distinction. A holder of the title has a seat in the House of Lords and is addressed as "My Lord" or "Your Lordship." His wife is addressed as "Madam" or "Your Ladyship."

A *baronet* occupies a place of rank between a baron and knight. He is addressed as "Sir." Baronets are not members of the House of Lords.

BARR, Amelia Edith Huddleston (1831–1919), an American novelist who won a reputation for excellent portrayal of character in stories with a historic background. Although born in England, she did all of her writing in America, to which she emigrated in 1854. The loss of her husband and sons in a Texas yellow-fever epidemic caused her to turn to literature for a livelihood, and for several years after 1869 she labored in New York as a hack writer. Her first notable story, *Jan Vedder's Wife,* a tale of the Shetland Islands, was an immediate success, and after its publication in 1885 she produced more than sixty other books. They include *A Border Shepherdess, A Daughter of Fife, The Lion's Whelp, The Bow of Orange Ribbon, The House on Cherry Street* and *Sheila Vedder.* Her autobiography, *All the Days of My Life,* was published in 1913. In 1918, when eighty-seven years old, she published *A Paper Cap,* a romance of industrial life in England.

BARR, Robert (1850–1912), a British novelist whose stories are enjoyed chiefly because of their action and spirit. He was born in Glasgow, Scotland, but was educated in Canada. In his novels he has represented both Canadian life and that of the "States." Barr wrote for the *Detroit Press* under the name of "Luke Sharp" for a period after 1876, and subsequently helped Jerome K. Jerome found the *Idler,* in England. His novels include *In the Midst of Alarms* (a story of the Fenian raid in Canada in 1866),

Countess Tekla, A Prince of Good Fellows and *The Palace of Logs.* He also published a series of travel sketches under the title *The Unchanging East.*

BARRANQUILLA, *bahr ran ke'lya,* COLOMBIA, a commercial city of importance, situated on the Magdalena River, fifteen miles from its mouth. The river has been dredged so as to permit sea-going vessels to pass up to the city, which is a leading center for the interchange of inland products and imports. The chief exports are coffee and hides. Population, 1912, 48,900.

BARRAS', PAUL FRANCOIS JEAN NICHOLAS Count de (1775–1829), a member of the French National Convention and of the Directory. After serving in the army in India and Africa, he joined the revolutionary party and was a deputy to the States-General of 1789. He took part in the attack upon the Bastille and upon the Tuileries and voted for the death of Louis XVI. In 1795 he was elected president of the Convention and later in the year was made a member of the Directory. From 1797 he governed absolutely until June, 1799, when Sieyès entered the Directory and in alliance with Bonaparte, procured his downfall.

BARRE, *bair'e,* VT., a city in Washington County, six miles southeast of Montpelier and 214 miles northwest of Boston, on the Central Vermont and the Montpelier & Wells River (a branch of the Boston & Maine) railroads. Barre styles itself the "monumental granite city of the world." About 4,500 men are employed in the vast quarries here; their work includes quarrying and manufacturing granite into monuments and mausoleums, also preparing it for buildings. Population, 1910, 10,734; in 1917, 12,401 (Federal estimate).

BAR'REL, a circular vessel bulging in the middle. Barrels are made of thin pieces of wood called *staves,* which are fitted together and arranged around circular boards that form the ends and are called the *heads.* The staves are held in place by hoops which are driven on tightly. The staves are made wider in the middle than at the ends, and this makes the bulge, which adds strength to the barrel. They also have a groove near each end into which the head, beveled for the purpose, fits. That part of the stave between this groove and the end is called the *chine.* Staves are made of oak and elm, and in barrels for holding liquids they are about three-fourths of an inch thick. Such barrels have a large hole in the middle called the *bung,* which is used in filling and emptying the barrel. Barrels are now made by machinery (see COOPERAGE).

By a law passed in 1915 the standard measurement for barrels in the United States is one with 21.5-inch staves and 17.125-inch heads. The material must not exceed 4-10 of an inch in thickness. The barrel must have a capacity of 7,056 cubic inches, and to sell a commodity by the barrel one must conform to this standard or be liable to a fine of $500 or to go to jail for six months.

In England a barrel of wine contains 31.5 gallons and a barrel of beer 36.5 gallons. In Canada the standard is as follows: wine barrel, 26.25 gallons; ale barrel, 31.5 gallons; beer, 36.5 gallons.

BARRETT, LAWRENCE (1831–1891), an American actor, born in Paterson, N. J. He made his first appearance on the stage at Detroit, Mich., in 1863, as Murad, in the drama of *The French Spy.* In 1861, at the beginning of the Civil War, Barrett for a time served as a captain of a company of Massachusetts infantry. Retiring from the army, he again acted in Washington, Philadelphia and New York City. In the last-named place he was advanced to performing Othello to the Iago of Edwin Booth. During 1873 and 1874 he starred in the large cities of the Union, and in 1875 he renewed his connections with Booth in New York City. Later he appeared in *King Lear, Julius Caesar* and Boker's *Francesca da Rimini.* Barrett's acting was distinguished for its superior intellectual quality. He wrote a *Life of Edwin Forrest* and a sketch of Edwin Booth.

BARRIE, *bair'ie,* JAMES MATTHEW, SIR, (1860–), a British novelist and dramatist, one of the foremost literary men of his time. His novels, which deal with the humble and everyday aspects of Scotch life, are unsurpassed for delicate humor, pathos and tenderness in character delineation. The sympathetic quality that distinguishes his stories is manifest, too, in a series of delightful plays, in many of which Maude Adams has appeared with brilliant success. He has written among stories, *Auld Licht Idylls, A Window in Thrums, The Little Minister,* (successfully dramatized), *Sentimental Tommy, Tommy and Grizel, Margaret Ogilvy* and *The Little White Bird.*

His plays include *The Professor's Love Story, The Admirable Crichton, Alice-sit-by-the-fire, Quality Street, Peter Pan, What Every Woman Knows, The Legend of Leonora and A Kiss for Cinderella.* In 1917 he wrote two one-act plays based on the World War—*Old Lady Shows her Medals* and *The New Word*—both admirable in every respect. A full-length drama, *Dear Brutus,* and a one-act play, *A Well-Remembered Voice,* produced in America in 1918–1919, are other excellent war plays from his pen.

JAMES M. BARRIE

Barrie was born in Kirrie-muir, Scotland, and was educated at Edinburgh University. He had won a substantial following as a writer by 1900, and has never since failed to interest a large circle of readers both in Great Britain and America. In 1913 he was knighted by King George V.

BAR'RIE, ONTARIO, county town of Simcoe County, on the north shore of Lake Simcoe, at an altitude of 726 feet, and on the Grand Trunk Railway. The principal industrial plants are factories for making boots and shoes, gas engines, flour, shingles, and there are tanneries, machine shops, woolen and flour mills. Owing to its pleasant climate and beautiful surroundings it is a popular resort. Population, 1916, 7,200.

BARRIER REEF, the longest coral reef in the world, extending 1,250 miles along the northeast coast of Australia, at a distance from land ranging from ten to 100 miles. In sailing from Sydney through Torres Straits, vessels have the choice of the inner or outer routes; the former, though narrow, gives a channel of about seventy feet deep throughout, and is protected from the sea by the reefs themselves; the outer channel is dangerous.

BARRISTER, *bair'is ter,* in England, refers to one who practices law and is entitled to plead cases at the bar of the court. The practice of law in Britain divides the functions which are exercised by American lawyers. *Solicitors* secure legal business, but cannot appear in court; they transmit their business to the barrister, who is responsible for court procedure.

BARRY, the family name of two men, father and son, who won distinction in England in the field of architecture.

Sir Charles Barry (1795–1860) designed such important buildings as the Reform Clubhouse, London, Saint Edward's School, Birmingham, and Manchester's Athenaeum, built in the Grecian style. Later he was appointed architect of the new Houses of Parliament at Westminster, with the execution of which he was occupied for more than twenty-four years. After this he was knighted and was made a Royal Academician.

Edward Middleton Barry (1830–1880), son of Sir Charles, succeeded his father as architect of the Houses of Parliament and besides this built Charing Cross, the new Covent Garden Theater and the new National Gallery in London.

BARRYMORE, *bair'i mohr,* a family name associated with the best traditions of the American stage.

Maurice Barrymore (1847–1905), in private life HERBERT BLYTHE, was born in India, educated at Cambridge, England, and in 1875 began a theatrical career in America. He married Georgiana Drew, sister of the actor, John Drew. Maurice Barrymore was leading man for Madame Modjeska, Mrs. Langtry, Olga Nethersole and Mrs. Fiske, taking the part of Rawdon Crawley in the production of *Becky Sharp,* in which Mrs. Fiske was starred. He was also a successful playwright.

Ethel Barrymore (1879–), daughter of Maurice Barrymore, appeared on the stage at the age of fourteen, and her career has been a series of brilliant successes. She is one of the foremost of American actresses. Among recent rôles which she has taken are the leading parts in *Tante,* by C. Haddon Chambers; *Our Mrs. McChesney,* based on the *Roast Beef Medium* stories of Edna Ferber; *The Lady of the Camellias,* a new version of Dumas' *Camille;* and *The Off-Chance,* a play of modern society life. Miss Barrymore has also appeared in moving pictures. In private life she is MRS. RUSSELL GRISWOLD COLT, and is the mother of three children.

John Barrymore (1882–), brother of Ethel Barrymore, is one of the most talented of the younger American actors. His work as a comedian is admirable, but he also won high praise for his interpretation of the leading male rôle in Du Maurier's *Peter Ibbet-*

son (season of 1917–1918) and in *Redemption* (1918–1919). Other plays in which he appeared successfully include *The Boys of Company B, Are You a Mason* and *The Fortune Hunter.* In 1915 he was engaged to appear as leading man for the Famous Players Film Company; he resumed picture-making activities for a brief period in the spring of 1918.

Lionel Barrymore, brother of Ethel and John, made his stage début in 1893. He has appeared in *Arizona, The Second in Command, The Best of Friends, The Other Girl* and *The Copperhead* (1918), and is also well known to moving-picture patrons.

BARTER AND SALE. *Barter* is the exchange of one commodity for another, as in the case of a boy who "trades" a knife for a kite, or the man who exchanges a horse for a piece of machinery. *Sale* is the exchange of a commodity for money. The law does not recognize a difference in the two methods of exchange, so far as title to goods is concerned. Barter was the earliest method by which commerce was conducted.

BARTHOLDI, *bahr tole dē',* FREDERIC AUGUSTE (1834–1904), a French sculptor, best known as the artist of the statue of *Liberty Enlightening the World,* now overlooking the harbor of New York (see LIBERTY, STATUE OF). His masterpiece is the *Lion of Belfort,* a statue commemorating the defense of Belfort in the Franco-German War.

BARTHOL'OMEW, the apostle, is probably the same person as Nathanael, mentioned in the *Gospel of Saint John* as one of the first disciples of Jesus. He is said to have taught Christianity in the south of Arabia, but there is nothing to confirm the statement.

BARTHOLOMEW'S DAY, SAINT, a feast of the Church of Rome, celebrated in honor of Saint Bartholomew. What is known as the Massacre of Saint Bartholomew was the slaughter of the French Protestants which began Aug. 24, 1572, by secret orders from Charles IX at the instigation of his mother, Catharine de' Medici, and in which, according to Sully, 70,000 Huguenots, including women and children, were murdered throughout the country. During the minority of Charles and the regency of his mother, a long war raged in France between the House of Guise and the Catholics on the one hand and the House of Condé and the Huguenots on the other. In 1570 overtures were made by the court to the Huguenots, which resulted in a treaty of peace. This treaty blinded the chiefs of the Huguenots, particularly Admiral Coligny, who was wearied with civil war.

The king appeared to have entirely disengaged himself from the influence of the Guises and his mother; he invited Coligny to his court, and honored him as a father. The sister of the king was married to the Prince de Béarn (1572) in order to allure the most distinguished Huguenots to Paris. Charles was induced by his mother to believe that Coligny had designs on his life. Accordingly, he consented to help her in her plans. On the night of Saint Bartholomew's day, at a signal from the tower of the royal palace, the assembled companies of the House of Guise fell on the Huguenots, and the bloody carnival began. Coligny was among the first to fall. Catharine compelled her son to acknowledge before the parliament his sole responsibility for the massacre. The king is said to have died of remorse for his part in the affair.

Related Articles. Consult the following titles for additional information:
Catherine de'Medici Guise
Coligny, Gaspard de Huguenots

BARTLETT, PAUL WAYLAND (1865–), an American sculptor, born in New Haven, Conn. He began the study of sculpture in early boyhood, and at the age of fourteen exhibited a bust of his grandmother in the Salon. The next year he became a student at the Ecole des Beaux Arts in Paris. Many honors have been bestowed upon him. It was Bartlett who made the equestrian statue of Lafayette which was presented to France by the school children of the United States. Six of his pieces ornament the front of the New York Public Library. There is an equestrian statue of Joseph Warren in Boston, statues of Columbus and Michelangelo in the Congressional Library in Washington, and a pediment of the House wing of the national Capitol, all products of Bartlett's genius.

BARTOLOMMEO, *bahr'to lom ma'o,* FRA (1475–1517), the name assumed by Baccio della Porta, a Florentine painter of renown. He studied under Roselli and came under the influence of Leonardo da Vinci and Raphael, the latter of whom was his intimate friend. Later his visit to Rome caused him to imitate Michelangelo. He was an admirer

and follower of Savonarola, on whose death he joined the Dominicans and assumed the name Fra Bartolommeo, but later he was persuaded to take up painting again. The distribution of light and shade and the general arrangement constitute the great merit of his art. In the convent of San Marco are some of Fra Bartolommeo's finished frescoes. Some of his best productions are a picture of Savonarola, *Saint Mark* in the Pitti Palace, *Saint Sebastian* and *Marriage of Saint Catharine,* in the Louvre, and *The Virgin upon a Throne,* in Florence.

BARTON, CLARA (1821–1912), an American philanthropist, revered founder of the American branch of the Red Cross Society. She was born in Oxford, Mass., and educated in Clinton, N. Y. Miss Barton became a teacher, founded a free school in Bordentown, N. J., and became clerk in the United States patent office in 1854. When the Civil War began she devoted herself to the care of wounded soldiers on the battlefield, and in 1864 she had charge of the hospitals with the Army of the James. In 1865 she visited Andersonville, Ga., to mark the graves of Union Soldiers. She also gave her services in the Franco-German War. In 1869, in Switzerland, Miss Barton had come in contact with the International Committee of the Red Cross, and after her return to America, subsequent to service in the Franco-German War, she took steps to found an American branch of the organization. In 1881 she became its first president.

CLARA BARTON

In 1884 Miss Barton represented the United States at the Red Cross Conference in Geneva, Switzerland, and was also a delegate to the International Peace Convention the same year in that city. In 1883 the United States Senate Committee on Foreign Relations requested her to prepare a *History of the Red Cross.* In 1898 she went to Cuba to distribute supplies furnished by the United States Government. Six years later she resigned the presidency of the Red Cross Society. See RED CROSS SOCIETIES.

BARYTA, *ba rĭ'tah,* oxide of barium, called also *heavy* earth, because it is the heaviest of the earths. It is generally found in combination with sulphuric and carbonic acids, forming sulphate and carbonate of barium, the former of which is called *heavy spar.* Baryta is a gray powder, has a sharp, burning taste and a strong affinity for water, and forms a hydrate with that element. With the acids it forms white salts, all of which are poisonous except the sulphate. Several mixtures of sulphate of barium and white lead are manufactured and are used as white pigments. Carbonate of barium is also used as the base of colors.

BASALT', a well-known igneous rock occurring in the ancient trap and the recent volcanic series of rocks, but most abundantly in the former. It is a fine-grained, heavy, crystalline rock, consisting of feldspar, augite and magnetic iron and olivine. Basalt is very common in regions that have been disturbed by volcanic action. Its tendency to crystallize in columns gives a peculiar character to the scenery. The columns are four-sided, six-sided or eight-sided, and are usually jointed. Fingall's Cave on the island of Staffa, the Giant's Causeway, Ireland, and the Cliffs along the Columbia River in Washington are illustrations. See IGNEOUS ROCKS.

BAS'COM, JOHN (1827–1911), a leading American educator who was president of the University of Wisconsin from 1874 to 1887 and at the same time was professor of mental and moral philosophy in the same institution. His principal fame was derived from several books written by him; among these are *Political Economy, Aesthetics, The Principles of Psychology, Philosophy of Religions, The New Theology, Social Theory, Growth of Nationality in the United States* and *God and His Goodness.*

BASCULE BRIDGE, a bridge built to lift upwards, in two parts from the center, each part opening and closing like a pocket knife blade. Counterpoise weights are at the extremes of each section. See BRIDGE.

BASE, in chemistry, a chemical compound which will unite with an acid to form a salt. The metal of the base takes the place of the hydrogen of the acid. A base may be an oxide, as calcium oxide or lime, or a hydroxide (hydrate), as potassium hydroxide. The union of a base and an acid usually destroys the properties of both. In some cases, however, not all the hydrogen of an acid is replaced by the metal of a base, and the salt formed may have acid properties.

BASEBALL, a game played with ball and bat, engaged in by eighteen men—nine on each of two opposing sides. It is popular above all other outdoor sports in the United States, and is assuming a place of prominence in Canada, England, and in some degree in France. There are two great leagues of baseball teams in the United States, the National and the American, each league operating under strict rules with respect to the other, and to various teams within its own organization. Below this group are so-called minor leagues of prominence to the number of eight or more. Amateur teams exist to the number of several thousand; they are found in every community. Professional baseball was seriously crippled through army conscription in the World War.

A Scientific Development. Baseball is possibly more carefully studied and scientifically developed than any other American enterprise. This may seem a strange and unlikely statement, but it is true. What business house figures on movements of employes down to seconds in producing certain results, or practices so persistently on "team work"? In the game of baseball as scientifically understood, a base-runner on first base knows that he has practically three seconds to get safely to second base, ninety feet away, before the pitcher can deliver the ball to the catcher and the latter has time to throw it to second base to intercept the runner. The loss of a fraction of a second in getting started may be fatal to the runner, or one superfluous motion or slightest error in judgment on the part of catcher or pitcher may give the runner all the time he needs.

Every player in the "big leagues" knows in terms of seconds the value of every play and constantly practices to make himself so perfect a part of a great machine that he shall never make an error of judgment. Errors he does make, but not many of them are due to poor judgment. Such splendid results as are achieved are due to constant, untiring practice, under the cold, critical eyes of masters of the game. A business house with an organization so compact as the "machine" which we call a major league ball team could do—well, there is very little in its line it could not accomplish.

Rules and laws governing the great leagues are copied in all the lower ranks; the boys on the vacant lot play the same game as the masters of the art in the great cities, and they play it intensely, as though it were the most serious matter connected with existence. No more exacting critics of famous players exist than these same boys when they witness a professional battle, and the youngsters know the various plays and players better than most adults.

Rules of the Game. A baseball field should be over 100 yards square. Ninety feet from the center of one side of the field is the white rubber slab (see *h*, Fig. 1), called the *home plate.* The *diamond* consists of a square 90 feet on a side, its three corners occupied by the white canvas bags or *bases,* which are known in succession from right to left as first base, second base and third base. In Fig. 1 the distances are all marked in feet. The lines which appear on the field are drawn solid, and those which are merely of assistance in laying out the field are dotted. Fig. 2 is an enlarged view of the home plate, with dimensions in feet and inches, and it shows, as well, the dimensions of the boxes within which the batsmen must stand. White chalk lines (*a a* in Fig. 1) indicate the position beyond which the player who is coaching, or advising, the base runner may not pass; and others (*b b*), the points beyond which the players waiting for their turns at bat shall not advance. The lines from the home plate to the first base and from the home plate to the third base are continued and known as foul lines (see Fig. 1), to guide the umpire in determining whether the batted ball is fair or foul, it being the latter if it strikes outside the foul line. It is customary to indicate by flags on the fence surrounding the grounds, or on poles in the ground far out in the field, the extremities of the foul lines. The ball is hard but elastic, 3 inches in diameter and weighs 5 ounces. The bat is of ash or some other elastic wood, tapering from a diameter of 2½ inches to a size convenient for the hands, and usually about 34 inches long. Balls and bats used by non-professional teams and by younger players may be smaller and lighter.

Each team consists of nine players. One nine is *at bat,* trying to run around the bases and make the scores upon which victory depends, while the opposing side is *in the field.* At intervals, when three batsmen are *out,* the teams change places, until each side has been at the bat nine times; that is, has had nine *innings.* If, for any reason, a game is stopped before four and a half innings have been played by either side, it is considered no game. If more than four and a half innings have been played, then the side which was ahead at the last even inning wins. If a game is a tie at the end of the ninth inning, play is continued until one side is ahead of the other at even innings or until the game is stopped by the umpire.

The team in the field consists of three divisions: the *battery,* the *infield* and the *outfield.* The positions of these men will be easily understood by consulting Fig. 1. The battery consists of the *pitcher,* who stands at the rubber slab (2) and throws the ball over the plate, within reach of the batsman's bat, but so swiftly or deceptively as to elude it if possible; and the *catcher* (1), who guards the home plate, catches the ball when it is not hit and returns it to the pitcher. The catcher is protected against glancing balls by a wire mask, an inflated chest protector and a heavily padded hand mit. The infield consists of a *first baseman* (3), a *second baseman* (4), a *shortstop* (5) and a *third baseman* (6). The outfield consists of a *right fielder* (7), a *center fielder* (8) and a *left fielder* (9). These men wear lightly padded gloves and are expected to catch the balls hit by the batsman. They do not always occupy the positions shown in the diagram, but move about according to the habits of the pitcher and batsman, especially noticing whether the batter is right or left-handed, and watching attentively any runners who may occupy bases.

The batter, who stands at *c* or *d* (Fig. 1), tries to knock the swiftly pitched ball into the field between the lines of the first and third bases, and out of reach of his opponents. An umpire watches the ball as it is pitched, and when it appears to pass over the plate higher than the batter's knees and below his shoulders, calls a *strike,* whether the batter strikes at such a ball, hits it foul or fails to strike at it. The third strike, however, cannot be called on a foul ball. After three

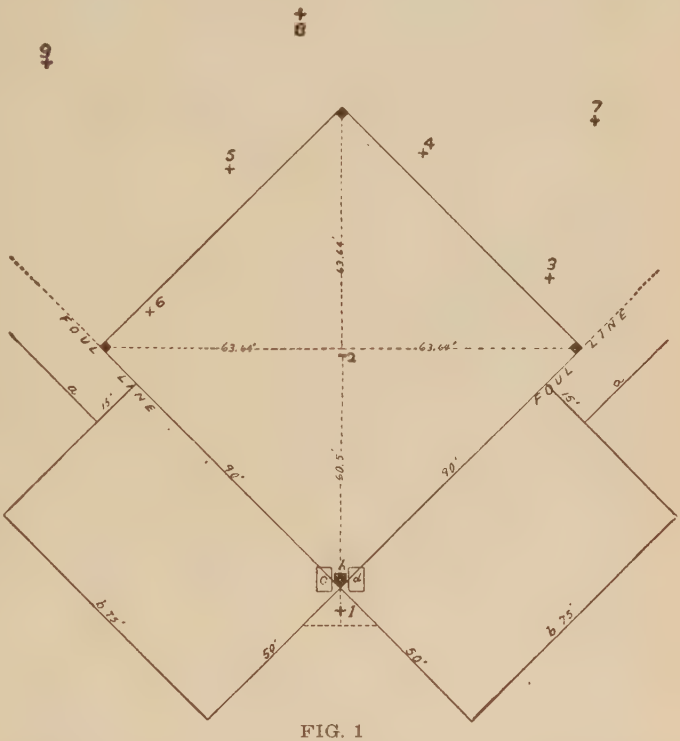


FIG. 1

strikes, the batsman is out and gives place to another player unless the catcher fails to catch the ball on the third strike and the batsman reaches first base before the ball. Pitched balls which do not pass over the plate or which do not pass at the right height, are called *balls,* and after four such balls the batsman is allowed to occupy first base unmolested. Having made a fair hit, the batsman becomes a baserunner and tries to make a circuit of the bases. If he reaches home after touching first, second and third bases in succession, he scores a point for his side. If the hit is caught on the "fly," or if the ball is held by an opponent on first base before the runner reaches that point, or if the runner while between bases is touched by the

ball in the hands of an opponent, he is out. Once having reached first base, however, he cannot be put out while in contact with a

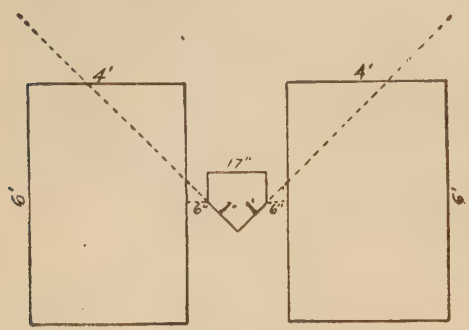


FIG. 2

base unless he is "forced off" that base by a following runner.

Every Man on Record. In no other sport, and in no business organization, is so careful a record kept of efficiency of the individual as in baseball. The record of every player is known from the Atlantic to the Pacific, and the man rises in the profession or falls as the published figures proclaim his strength or weakness. A record of the players in a single game indicates how figures for a week, a month, and an entire season are compiled. The Chicago "White Sox," of the American League, played the St. Louis team of the same League, on a certain day, and the official score for the "White Sox" was as follows:

	AB	R	BH	TB	BB	SH	SB	PO	A	E
Liebold, lf.....	4	1	2	2	0	1	0	1	0	0
Murphy, rf....	5	1	2	4	0	0	0	1	3	0
Collins, 2b.....	5	1	1	1	0	0	0	1	0	0
Felsch, cf.....	4	2	3	5	0	0	2	0	0	0
Weaver, ss....	4	0	1	1	0	0	0	0	4	0
Gandil, 1b.....	1	1	0	0	2	1	0	2	4	0
Risberg, 3b....	4	0	1	2	0	0	0	19	0	1
Schalk, c.....	4	1	2	4	0	0	0	3	0	0
Cicotte, p.....	0	0	0	0	0	0	0	0	0	0
Total	31	7	12	19	2	2	2	27	11	1

Explanation of "Box Score." When the columns of figures and abbreviations are explained the average reader will see more clearly the system by which efficiency is noted and defects are emphasized. A glance at the table gives the story of the game. The names of the playing positions are shown in the diagram in the article *Baseball*, in Volume One. The symbols heading the columns follow:

AB—At Bat. Number of times the player is charged with his turn at batting the ball. In the case of a sacrifice hit or base on balls, or if the batter is hit by a pitched ball, he is not charged with a turn at bat.

R—Runs. The total number of runs made by the player during the game.

BH—Base Hits. The number of times the batter hits the ball to a section of the field where it could not be caught, or from which it could not be thrown to first base before the batter reached there.

TB—Total Bases. The number of bases gained by a player as the direct result of his own hits.

BB—Bases on Balls. Showing the number of times the batsman was allowed to go to first base because the pitcher could not or would not pitch the balls accurately.

SH—Sacrifice Hits. With a runner on a base the man at bat may simply allow a pitched ball to hit his bat and thus he may easily be "put out" at first base, but the play enables his fellow player to advance a base and thus increase the chances that the team will score.

SB—Stolen Bases. The number of times a player gains a base by cunning and strategy, unassisted by any other member of his team.

PO—Put Out. The number of times a man is able to retire an opposing player. A "put out" may be made without assistance, as, for instance, when a player catches a batted ball before it touches the ground or stops a fast rolling ball and through his own efforts "puts out" a runner, or it may be the result of an "assist."

A—Assists. The number of times a player by timely throwing of the ball assists a fellow player to "put out" an opposing base runner.

E—Errors. The number of misplays or mistakes committed which give the opposing team an advantage.

In the game recorded above, Liebold went to bat five times, hit the ball safely twice and both times succeeded in getting to first base on his hit. On one of those occasions he was fortunate to continue safely his circuit of the bases and score one run for his team. In one of the other three times at bat he sacrificed his chance to make a hit by lightly intercepting the ball with his bat and making it difficult for opposing players to get it. This allowed a fellow player to gain a base, but Liebold was unable to reach first base in safety. The sacrifice hit is included in the "A B" Column.

The above analysis will enable the reader to read the detailed account of each player's work.

History. The game probably originated in the English game of rounders, though

simpler games employing ball and bat, such as one-old-cat or town ball, were played in the United States before baseball. Prior to 1842 no such game as our modern baseball was known, and its development has been altogether American. It was introduced into England in 1874, later into Australia and, to some extent, into Japan. In 1845 the Knickerbocker Club of New York drew up the first set of rules for the game, and between 1857 and 1871 a national association supervised the rules. During the War of the Rebellion baseball was played in both armies with enthusiasm, and the soldiers returning home communicated their interest to all sections of the Union. Soon the National Association, an openly professional league, was organized, but because of its gambling operations was supplanted after five years by the present National League. This league together with the American League, which appeared in 1900, has since guided the development and formulated the rules of the game.

BASEL, *bah'zel*, COUNCIL OF, an ecclesiastical council, held at Basel from 1431 to 1449, summoned by Pope Martin V. Soon after the Council had constituted itself, the new Pope, Eugenius IV, requested the cardinal legate, Cesarini, to dissolve it and call one a little later at Bologna. The Council refused to dissolve and proceeded to transact business. Its main objects were the union of the Greek and Latin churches, a compromise with the Hussites and the institution of certain reforms within the Church. The Council was, on the whole, a failure.

BASEL, SWITZERLAND, the most important commercial center of the republic and the capital of the half canton of Basel-Stadt. It is situated forty-three miles north of Bern, and consists of two parts, on opposite sides of the Rhine, connected by three bridges. It has an ancient cathedral, founded in 1010, containing the tombs of Erasmus and other eminent persons; a university, founded in 1459; a seminary for missionaries, and a museum containing the valuable public library and pictures. The industries embrace the manufacture of silk ribbons, paper and aniline dyes, tanning and brewing. In this city was signed the treaty of peace between France and Prussia, and that between France and Spain, both in the year 1795, and here was held an ecumenical council in 1431 (see BASEL, COUNCIL OF). Population, 1913, estimated, 137,000.

BASIL'ICA. Among the Greeks and Romans originally a basilica was a public hall of justice or a courthouse in which the magistrates administered justice. It was generally oblong in shape and was adorned with rows of columns, which divided it into aisles, the middle one being the widest and having at the end a semicircular or square apse, in which the tribunal was placed (see APSE). The basilicas gradually became market places and exchanges, and at the beginning of early Church history, some of them were changed into Christian churches. Various modifications were from time to time introduced, until they differed greatly from the original form. One of the oldest churches in Quebec is called the Basilica.

BASILISK, *baz'i lisk*, a fabulous creature, variously regarded as a kind of serpent, lizard

THE MYTHICAL BASILISK

or dragon. It inhabited the deserts of Africa, and its breath, and even its look, was fatal. The name is now applied to a species of harmless lizards, distinguished by an elevated crest or row of scales, which, like the dorsal fins of some fishes, runs along the whole length of the back and tail. The *mitered* or *hooded basilisk* is especially remarkable for a membranous bag at the back of the head, of the size of a small hen's egg, which can be inflated with air. The other species have such hoods, but of a less size.

BASIL THE GREAT (about 330–379), a theologian, the founder of Eastern monasticism, born at Caesarea. He received a thorough education, after which he became closely identified with the social life of Caesarea, but soon directed his energies to religious work. For a number of years he subjected himself to the severest denials, which gave him wide reputation among the leaders of the Church. He was made presbyter of Caesarea in 364, and later he was appointed bishop of Caesarea and Cappadocia. He was noted for his great courage and strict adherence to his belief, which caused him several prolonged controversies of a theological nature. He possessed excellent literary ability and wrote many letters and works

of a theological nature. Of these the *Nicene and Post-Nicene Fathers* has been translated into English.

BASIN, in physical geography, a term referring to an area, great or small, which is drained by a river and its tributaries. The high stretch of land dividing one river basin from another is the *watershed;* the various watersheds divide each country into its river basins. The basin of a lake or sea consists of the basins of all the rivers which run into it.

In geology a basin is any dipping or disposition of strata toward a common axis or center, due to upheaval and subsidence. It is sometimes used almost synonymously with "formation," to express the deposits lying in a certain cavity or depression in older rocks. See PHYSICAL GEOGRAPHY.

BASKET AND BASKETRY. Baskets are made by weaving together twigs, splints, leaves, grass or wire, and the art of making them is known as basketry.

The most common baskets are made from thin, flat strips of wood, called *splints.* Ash, oak, elm and birch are the woods most frequently used. The splints for handmade baskets are obtained by beating the logs with a heavy maul until the wood readily splits into thin pieces. The splints are then cut to the proper width, finished and soaked in

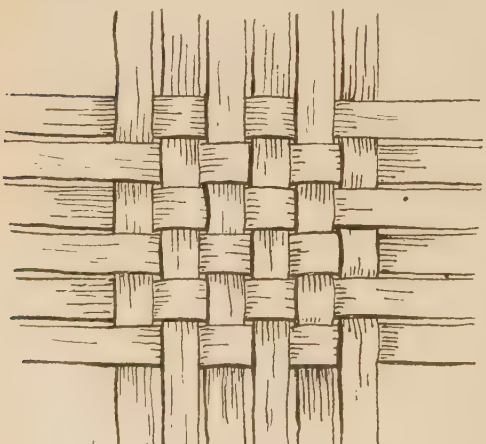


FIG. 1

water until they can be bent to any desired shape. Twigs of the willow are used for making many kinds of baskets and for baby carriages, chairs and other articles of furniture; in Holland, Germany and France the growing of willows for basketry constitutes an important industry. In the United States baskets used for marketing fruit are made by machinery and the sides and bottom are often of one piece. Basketry is among the simplest of the mechanic arts, and wherever uncivilized races have been found, their women are seen to be skilful in weaving textiles into baskets, cloth and matting. Among all uncivilized tribes this work bears evidence of more or less skill, but as far as known, the American Indians excel all others in the variety, designs and finish of their baskets,

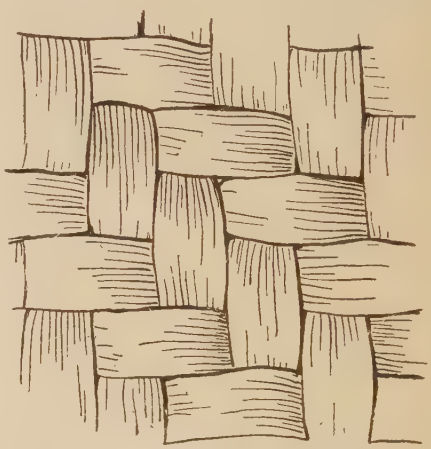


FIG. 2

and it is from them that many of the most useful and beautiful designs have been obtained. Basketry is an art readily learned by those who are crippled or deformed in such a way as to render them unfit for most occupations, and it is taught in many schools for these unfortunates.

Manufacture. The manufacture of baskets includes gathering and preparing the material as well as fashioning it into the finished article. The processes involved and the labor necessary depend upon the material used and the kind of baskets that are to be made from it. All baskets, according to their construction, can be divided into two classes, woven baskets and coil baskets.

Woven Baskets. The simplest form of woven basketry and that in most general use for large baskets is *checker work,* in which the splints cross at right angles, each splint of the "weft" running alternately above and below the splints of the "warp." This style of weaving is employed with both large and fine splints, but more frequently with the larger ones. See Fig. 1.

INDIAN BASKETRY

1 and 16, Hopi Coiled Plaques.
2, Oregon and California Twined Basket.
3 Klikitat Imbricated Basket.
4 and 9, Washo Basket Bowls.
5, Klamath Gambling Tray.
6, 7 and 11, Tlinkit Twined Baskets.
8 and 10, Salish Imbricated Baskets.
12 and 18, Tlinkit Covered Baskets.
13, Mission Indian Coiled Plaque.
14, Tulare Coiled Jar.
15, Apache Ancient Water Jar
17, Panamint Coiled Bowl

The style of weaving common in baskets made of cane is known as *twill work*. This consists in passing each splint of the weft over two or more splints of the warp, then under two, forming a diagonal or twilled pattern. These patterns are subject to a great variety of changes. See Fig. 2.

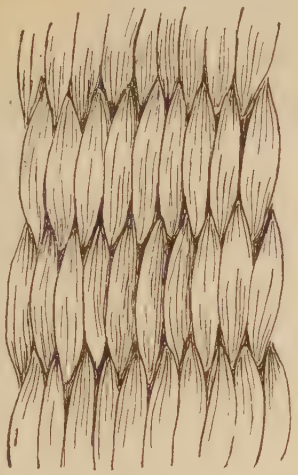


FIG. 3

Another common style is the *wicker work* so frequently seen in willow baskets. This also is subject to a great variety of changes and patterns and is often combined with twilled work, for which it forms borders. See Fig. 3.

The style of weaving common among the Indian tribes of the Rocky Mountains and all along the Pacific coast is *twined work*. This is the most intricate and also the most beautiful of all styles of weaving. The warp consists of rigid rods or splints, and the weft is in pairs or in three-strand, twining and braiding in threes. In passing from rod to rod of the warp, the weft strands are twisted in half-turns. Twined work is subject to many changes of pattern and some of the most beautiful basketry is made in this way. See Fig. 4. In Fig. 5 is shown the plan of starting a basket in three-strand braid and twined work.

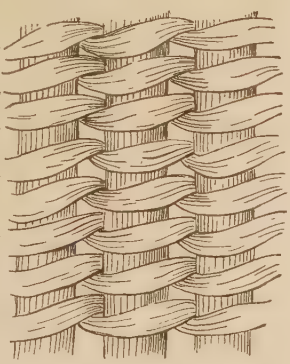


FIG. 4

Coiled Baskets. Coiled baskets are made by sewing over and over with some sort of flexible material, each stitch interlacing with the one underneath. What corresponds to the warp in the woven work is of a coarser and a more rigid material, and a fine, flexible bark is used for the sewing. This style of basketry is very popular in what is known as *raffia* work in the schools. There are many varieties of coiled work and the variety of production is equally great. Among the Indians specimens of coiled baskets have

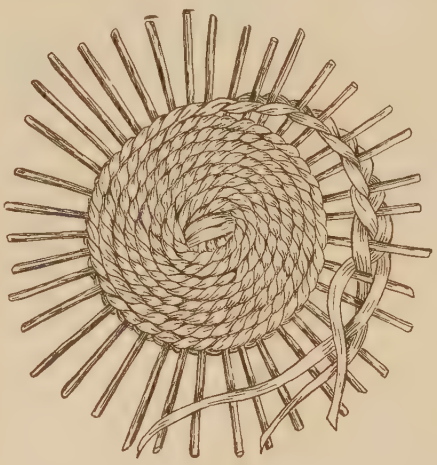


FIG. 5

been found so small that they would pass through a lady's finger ring, while others are larger than an ordinary barrel. This plan of basketry admits of the use of a finer and more flexible material than is generally employed in woven work, and for this reason more beautiful and delicate results can be obtained. The stitches may be coiled openly, forming what is known as *openwork,* shown in Fig. 6, or they may be coiled about the

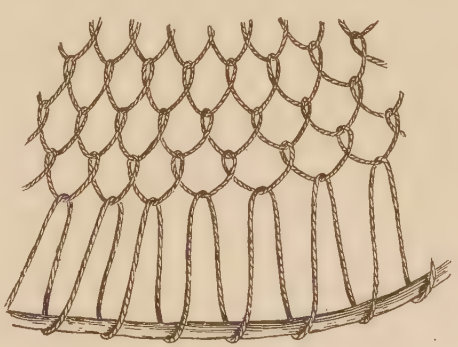


FIG. 6

body of one or more rods or splints. Fig. 7 shows a very common pattern, in which the stitches are coiled around three rods. By varying the form of the stitch the basket-maker introduces bands and thus breaks the monotony of the surface, adding to the grace

and beauty of the basket. Basketry is a valuable occupation for children because of

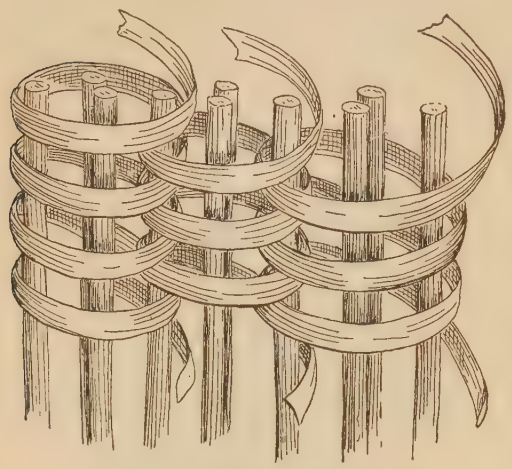


FIG 7

the excellent training it gives the hand and the eye.

Consult Mary White's How to Make Baskets and More Baskets, and How to Make Them.

BAS'KET BALL, an American winter game that has in recent years come into great popularity with both sexes in their gymnasiums. Basket ball enjoys the practically unique distinction of being the invention of one man. With the gradual development of the Young Men's Christian Association throughout the country there had arisen a demand for an indoor game which should take the place of baseball and football and at the same time break the monotony of gymnasium work. In 1891 Dr. James Naismith, an instructor in the training school of the Y. M. C. A. at Springfield, Mass., worked out the game of basket ball for his classes. The game was tried by the various classes, and a few minor changes were made from time to time. These facts explain why it was that basket ball was at first played only by teams formed by members of the various Young Men's Christian Associations in different cities. But the game became so popular in these circles that it spread to schools and colleges, to other athletic clubs, and to the general public everywhere.

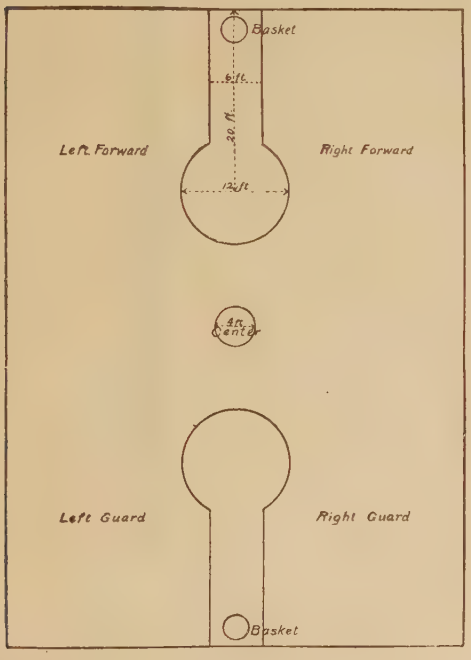
Why the Game is Beneficial. Basket ball is deservedly a popular game for boys and girls of all ages and all classes; it calls for healthful exercise of all parts of the body. Every boy or girl who has played the game knows that using feet only will not make a good player; no matter how strong the hands and arms may be, they alone will not enable the player to cover the ground. Alertness of eye, quickness of movement, accuracy and endurance are necessary. Perhaps even more valuable than this all-round development of the body is the simultaneous development of the mind. Every second of play presents a new situation to the mind. The player must decide at once; he must seize his opening the moment it appears. No boy can play basket ball and remain slovenly and careless in his habits and manner. The very nature of the game requires him to be wide-awake and energetic. The boy who never cares, who never has energy enough to do what is expected of him, who is always tired, will soon find that there is no place for him in a basket ball game. It does not require a boy of great physical strength to play basket ball. Any healthy boy who can run on his legs and move his arms will find that basket ball is doing him good. The game does not need boys already fully developed; its purpose is to help in their development.

There remains a still greater benefit to every player. Aside from quickness of movement and of judgment, basket ball requires coolness and self-control. The training thus acquired will stand in good stead in later years. A player may be knocked over accidentally: has he the right to lose his temper, thus lessen his own value to the team and disturb his team-mates? Certainly not. Everybody knows that a player who has lost his temper quickly loses his head; then he is better on the side-lines than in the game. The boy who fights hard, plays a clean, square game, and keeps his temper, is the boy who will come out on top in basket ball as in every other game or activity in life. Basket ball helps to develop the manly characteristics of a boy's nature. The writer has seen many a player help his opponent up and ask him if he was hurt or apologize to him for the accidental push. There was no desire to stoop to a weaker man or bow down to a stronger one, but it was simply an exhibition of the spirit of fair fighting, the spirit which must prevail in all sports.

A Game for Girls. Basket ball soon after its invention was adopted as a game for girls. Whatever may be said of it as a game for boys may be equally well said of it as a pastime for girls. It will help to develop the girls physically and mentally during the years

when they most need healthful exercise. The girl who mopes around the house all day long, the girl who is always dissatisfied, the girl who has no interest but her own pleasure, is just as disagreeable as the boy who is always tired and doesn't care. The growing girl needs exercise just as much as the growing boy. With some slight modifications of the rules, such as shortening the time and making all roughness impossible, basket ball has become as popular for girls as for boys. "The proof of the pudding is in the eating;" the value of basket ball is proved by playing the game.

Field and Equipment. The field should be large enough to give free and unimpeded action to the ten men who play in the game,



should be longer than broad, and should not cover more than 3,500 square feet of actual playing space. The accompanying diagram shows how the field should be laid out, and gives the dimensions of the required lines. The heavy lines of the diagram should be painted in black on the floor of the gymnasium. At the center of each end of the field is a basket 18 inches in diameter, whose rim is 10 feet from the ground, and 6 inches away from the rigid, smooth supporting surface back of it. This smooth surface, or background, must be at least 6 feet horizontally and 4 feet vertically, and must extend not less than 3 feet above the top of the basket. The round ball, which must not be more than 32 nor less than 30 inches in circumference, is an inflated rubber bladder covered with a leather case. Each team is composed of five men; two known as *forwards*, two as *backs* or *guards* and one as the *center*.

How the Game is Played. The game is played in two halves of limited time, each opposing team defending one of the baskets. The object of the game is for members of one team to throw the ball into the basket of the opposing team. Each time a "basket" is so thrown during actual play, two points are scored. In case a "foul" is called by an official against any member of a team, a designated player from the other side may have what is called a "free throw;" that is, he stands in the center of the circle, twenty feet from the basket, and has a right to throw the ball if possible into the opponent's basket without any interference or interruption from the other side, all the players being kept outside the circle and the lane shown in the diagram. A basket so thrown counts one point for the side making it.

At the beginning of the game the centers from the opposing team stand within the central four-foot circle, each facing his opponent's basket. The referee takes the ball and tosses it into the air so it will come down between the two centers, each of whom endeavors to strike or obtain possession of the ball. From the moment the ball is thrown, play is begun. The men follow the ball over the field, all trying to get possession of the ball so as to throw it into the basket nearest the forwards when the game started, or pass it on to a forward of their own side, who may have opportunity to make the basket. The business of the backs, or guards, is to prevent the forwards of the other team from throwing a basket, and to get the ball and pass it to their own forwards.

There is fine chance for team work in the game, and a well drilled team has its signals by which players are informed as to the general course of the play, if it is not broken up. The ball may be caught, thrown or struck with the open hand, but no person having caught the ball can take more than one step with it. The ball must not be kicked or struck with the foot or body and when caught it must he held entirely by the hands. Opponents must not touch the body of the

person carrying the ball if they can avoid it, but they may interfere with his throwing it in many ways. If the ball goes outside the boundary lines, a player of the side opposite to the one who forced the ball outside has a right to throw it to a member of his team inside, or in case of doubt, the official may decide to throw it up between two opposing players at the spot where it crossed the line.

At any time when the ball is held by two players of an opposing side, the referee throws it up between them, as in the center at the opening of the game. The game is governed by special rules, which vary somewhat from year to year and which provide for the various emergencies that may arise and determine what shall be considered fair or foul play and what penalties shall be assessed. Using the fist, kicking, striking, shouldering, tripping and unnecessary roughness are all barred. See ATHLETICS.

BASQUE, *bask,* a group of people dwelling partly in the southwestern corner of France, but mostly in Spain near the Pyrenees. The same name is given to their language, supposed to be present-day representation of the medieval Iberian tongues. Ignatius Loyola and Saint Francis Xavier were natives of the Basque provinces.

BAS-RELIEF, *bah releef',* (or low relief) is the mode of sculpturing figures to give them a slight projection from the background. Strictly speaking, the height should be less than half of the thickness of the figure. The frieze of the Parthenon at Athens has the most famous examples of bas-reliefs in the world. See ALTO-RILIEVO; MEZZO-RILIEVO.

BASS, the name applied to various species of game fish which are highly prized for food. They are the delight of the sportsman because of their fighting qualities. Most

BLACK BASS

species live in fresh water, but there are also salt-water varieties. The *large-mouthed black bass* and the *small-mouthed black bass* are among the best game fishes of the United States. The former are more plentiful in lakes, while the latter prefer clear water and running streams. Both species vary considerably in color, those in clear water being much lighter and brighter and frequently thought to be entirely different fishes from their relatives of dark water. In most states they are protected by law through the greater part of the year. They are taken with light rods and tackle and make a vigorous fight for liberty. The large-mouthed black bass sometimes attains a weight of more than six pounds—twelve-pound specimens have been caught; the small-mouthed seldom weigh over two pounds.

There are also numerous fresh water species of less value. Among these are the *white bass,* found in the vicinity of the Great Lakes, the *striped bass* or *rock fish* of the Atlantic coast, from Florida to the Gulf of Saint Lawrence, and the *yellow bass,* found in the lower Mississippi. Most of the other species of fishes called bass belong to the perch family.

BASSOON

Sea bass common along the southern Atlantic coast are known in various localities as *red-fish, red-horse* or *red-drum,* from their reddish-brown color. They sometimes attain a weight of fifty pounds. The lips are tough, the fins large and the scales so big that in the largest specimens they are removed with a hoe. Smaller ones run in companies and go by the name of *school bass,* while the larger ones are found in pairs or singly and are called *channel bass.*

BASS, *base,* or **BASSO,** (*ba'so*). See SINGING.

BASSE-TERRE, *bas tare',* the capital of Saint Christopher, or Saint Kitts, one of the British West India Islands, is situated on the south side of the island on the mouth of a small river. It has a good harbor and is a seaport of some importance, since the surrounding country yields abundant crops of sugar cane and tropical fruits. The town was destroyed by fire in 1867 and has been

rebuilt on a modern plan. Population, about 9,000.

BASSOON', a musical wind instrument of the reed order, consisting of four tubes. It is blown through a bent metal mouthpiece. The tubes are holed and keyed like the clarinet. For convenience of carriage the instrument is divided into two or more parts, whence its Italian name *fagotto,* a bundle. It serves for the bass among wood-wind instruments. Its compass comprehends three octaves, rising from B flat below the bass staff.

BASS STRAIT, a channel 185 miles in length beset with islands and coral reefs, which separates Australia from Tasmania. It was discovered by George Bass, a surgeon in the royal navy, in 1798.

BASS VIOL, a large stringed instrument, shaped like the violin, occupying the position of the stringed bass instrument in orchestras. When being played, the base rests upon the floor, and the instrument is supported by the performer's knees. It has three strings and a usual range of two octaves.

BASSWOOD LEAF

BASSWOOD, a large, handsome tree which in open places reaches out wide-spreading branches, but is taller and straighter, with shorter branches, in densely wooded spots. It grows practically throughout North America, east of the longitude of Colorado. The tree has large, rounded leaves and small yellow flowers, rich in perfume and in honey for bees. The wood is soft and is often called *whitewood;* it is used for honey-boxes, furniture, etc. The tree will live for two hundred years or more.

BASTIEN-LEPAGE, *bas tyaN' le pazh',* JULES (1848–1884), a French portrait and landscape painter. At an early age he showed an inclination for painting, and after taking several prizes for drawing he went to Paris to study, where he attended the Ecole des Beaux Arts. Among his works are the *Song of Spring, Portrait of My Grandfather,* which brought him fame, *Joan of Arc Listening to Voices, The Forge* and *The Haymakers.* The latter is an excellent example of realism. Through his *Portrait of Madame Bernhardt* Bastien-Lepage won the Cross of the Legion of Honor.

BASTILLE, *bas teel',* a famous state prison in Paris, captured by a mob on July 14, 1789, a date now observed each year as a national French holiday. The Bastille was built about 1370 by Charles V. It was ultimately used chiefly for the confinement of persons who had fallen victims to the intrigues of the court or the caprice of the government, and thus was regarded as a symbol of oppression.

The capture of the Bastille was the opening act of the French Revolution. The mob first attempted to negotiate with the governor, Delaunay, but when these negotiations failed, began to attack the fortress. For several hours they continued their siege without being able to effect anything more than an entrance into the outer court of the Bastille; but at last the arrival of some of the Royal Guard with a few pieces of artillery forced the governor to let down the second drawbridge and admit the populace. The governor was seized, but on the way to the town-hall he was torn from his captors and put to death. The next day the destruction of the Bastille commenced. The key to the edifice was sent to George Washington. Today the site of the Bastille is marked by a bronze column.

In the French language *bastille* means any strongly fortified structure.

BASUTOLAND, *ba su'toh land,* a small British dependency in South Africa, 11,716 square miles in area, lying between Orange Free State, Natal and the Cape of Good Hope Province. It is within about 100 miles of the Indian Ocean. Nature is kind to Basutoland, for it is one of the most delightful parts of British Africa, especially favorable to grain production and to cattle rais-

ing. It is in part mountainous, with very fertile valleys. The government is under a high commissioner accountable to the higher authority of the Union of South Africa, but local affairs of the natives are managed by hereditary chiefs. Population, 1911, 404,507, of which all but 1,400 were native blacks.

BAT. A furry mammal having the fore limbs peculiarly modified so as to serve as wings. Bats are animals of the twilight and darkness and are common in temperate and warm regions, but they are most numerous and largest in the tropics. All European bats are small and have a mouselike skin. The body of the largest British species is smaller than that of a mouse, but its wings stretch about fifteen inches. During the day it remains in caverns, in the crevices of ruins, hollow trees and other lurking places, and flits out at evening in search of food, which consists of insects. Several species of the same genus are common in North America. Many bats are remarkable for having a curious growth on the nose shaped something like a horseshoe. In some bats these growths resemble leaves, and in one species the entire nose looks like a flower. The eyes in most bats are very small, but they are keen.

Bats may be conveniently classified in two sections: the flesh-eating, comprising all European and most African and American species, and the fruit-eating, belonging to tropical Asia and Australia, with several African forms. At least two species of South American bats are known to suck the blood of other mammals, and hence they are called *vampire bats* (see VAMPIRE BAT), though the name has also been given to a species not guilty of this habit. As winter approaches, in cold climates bats seek shelter in caverns, vaults, ruined and deserted buildings and similar retreats, where they cling together in large clusters, hanging head downward, and sleep until the returning spring recalls them to life. The *brown bat* of the United States, the *heavy bat* of the Eastern states, the *big-eared bat* of the Mississippi valley, the *leaf-nosed bat* and the *lyre bat* are common species. Bats belong to the order Chiroptera (which see).

BATANGAS, *ba tahn'gas,* the name of a province and also of its capital city, on the island of Luzon, in the Philippines. The province has an area of 1,108 square miles and a population of 257,715. Sugar, rice, hemp, coffee, oranges and bananas are the principal products. The city of Batangas is well built and has a population of about 34,000.

BATA'VIA, a city and seaport of Java, and the capital of all the Dutch East Indies. It is situated on the north coast of the island, on a wide, deep bay. The principal warehouses and offices of the Europeans, the Java Bank, the exchange and other business buildings are in the old town, which is built on a low, marshy plain near the sea, intersected with canals. The Europeans reside in a new and more healthful quarter. Here is located one of the most beautiful botanic gardens in the world. Batavia is the chief commercial city of the East Indies, and has a large trade in sugar, coffee, rice and indigo. It was founded by the Dutch in 1619 and attained its greatest prosperity in the beginning of the eighteenth century. Its inhabitants are chiefly Malay, with a considerable mixture of Chinese and a small number of Europeans. Population, about 140,000.

BATAVIA, N. Y., the county-seat of Genesee County, thirty-six miles east of Buffalo, on Tonawanda Creek and on the Erie, the Lehigh Valley and the New York Central railroads. It is in a farming region and has manufactories of agricultural implements, shoes, firearms, rubber tires, etc. The state institution for the blind is here, and the city has a public library which is a memorial to William Morgan, a citizen of Batavia who became famous during the Anti-Masonic excitement in 1826. Batavia was founded in 1801. Population, 1910, 11,613.

Entrance to the Baths of Caracalla

BATH. The use of the bath is an exceedingly old custom. Homer mentions the bath as one of the first refreshments offered to a guest; thus, when Ulysses enters the palace of Circe, a bath is prepared for him, and he is anointed after it with costly perfumes. In later times, rooms, both public and private, were built expressly for bathing, the public baths of the Greeks usually being connected with gymnasiums. The fullest details we have with respect to the bathing of the ancients apply to its luxurious development under the Romans. Their bath-

ing establishments consisted of four main sections: the undressing room, with an adjoining chamber in which the bathers were anointed; a cold room with provision for a cold bath; a room heated moderately to serve as a preparation for the highest and lowest temperatures, and the sweating-room, at one extremity of which was a vapor-bath, and at the other, an ordinary hot bath. After going through the entire course, both the Greeks and the Romans made use of scrapers, either of horn or metal, to remove perspiration, oil and impurities from the skin. Connected with the baths were walks, covered race grounds, tennis courts and gardens, the whole, both in the external and internal decorations, being frequently on a palatial scale. The groups of the Laocoön and the Farnese Hercules were both found in the ruins of Roman baths.

At the present time the bath commonly in use in Russia consists of a single hall, built of wood, in the midst of which is a powerful metal oven, covered with stones and surrounded with broad benches, on which the bathers take their places. Cold water is then poured upon the heated stones, and a thick, hot steam rises, which causes the perspiration to issue from the whole body. The bather is then gently whipped with wet birch rods, rubbed with soap and washed with luke-warm and cold water; of the latter, some pailfuls are poured over his head, or else he leaps, immediately after this sweating-bath, into a river or pond, or rolls in the snow. The Turks, by their religion, are obliged to make repeated ablutions daily, and for this purpose there is in every city a public bath connected with a mosque. A favorite bath among them is a modification of the hot-air bath of the ancients, introduced generally under the name of *Turkish bath* into other than Mohammedan countries. A regular accompaniment of this bath, when properly given, is the operation known as "kneading," generally performed at the close of the sweating process, after the final rubbing of the bather with soap. It consists in a systematic pressing and squeezing of the whole body, the stretching of the limbs and the manipulating of all the joints, as well as the fleshy and muscular parts of the body (see MASSAGE).

Public baths are common throughout Europe, but they are less a feature of American cities because of the prevalence of bathing facilities in private homes or apartment buildings. Free public baths for the poor are maintained in many cities in the congested districts. The gymnasiums at colleges and high schools have baths where the athletes may bathe after exercise, and at many of the public schools bathing privileges are afforded the pupils. In various parts of the country are hot springs and medicinal springs, where large sanitariums have been erected for the invalids who go to the springs to bathe. Among the most famous are those at Hot Springs, Garland County, Ark., resorted to by invalids for the cure of rheumatism and similar complaints. There are from seventy-five to one hundred springs, varying in temperature from 105° to 160°, issuing from a lofty ridge of sandstone overlooking the town, while others rise in the bed of the stream near by. The most celebrated natural hot baths in Europe are those of Aix-la-Chapelle, Karlsbad and Baden in Germany; Toeplitz, in Bohemia; Bagnières, Baréges and Dax, in the south of France, and Spa, in Belgium.

Cold baths are invigorating and stimulating and should be taken in the morning unless followed by a chill; warm baths are restful and quieting and may be taken at any time; hot baths are weakening and should be taken at night, or only when it is possible to rest for a long time after them. There is a great difference in the effects of baths upon different individuals, and every person should be observant for himself. A cold morning bath of the neck and chest is a good preventive of "taking cold." Such measures can be taken by everybody.

BATH, ENGLAND, on the Avon River, 100 miles west of London, is a noted health resort. It is situated in a narrow valley, and the place has beautiful surroundings. The most interesting building is the Abbey Church, which is considered one of the finest specimens of perpendicular Gothic architecture in Europe. Bath is celebrated for its hot springs, which have strong medicinal properties. These springs yield about 200,000 gallons of water a day. The city was founded by the Romans, who named it Aquae Solis, meaning the *waters of the sun.* The town reached the height of its influence and prosperity under the leadership of Beau Nash in the eighteenth century, when it became a very fashionable resort. Population, 1911, 50,729.

BATH, Me., the county seat of Sagadahoc County, on the Kennebec River, twelve miles from the ocean and thirty-six miles above Portland. It is served by the Maine Central railroad. Bath is especially known for its ship building; several vessels for the United States navy have been launched here. Allied industries are foundries, machine shops, boiler works, etc.; gas engines are also made. The town was founded in 1660 as a missionary outpost, was incorporated in 1781 and made a city in 1847. Population, 1910, 9,396; in 1919, practically unchanged.

BATH, Order of the. See Order of the Bath.

BATON ROUGE, *bat'on roozh*, La., one of the earliest French settlements in Louisiana Territory, later belonging to England and then to Spain. It is eighty miles northwest of New Orleans, on the Mississippi River, and on the Yazoo & Mississippi Valley and the New Orleans, Texas & Mexico railroads and also on the Louisiana River & Navigation Company's line. The city was the capital of the state in 1849, but lost the distinction to Shreveport in 1862 and to New Orleans in 1864, during the Civil War. In 1882 the capital was restored to it. The city adopted the commission form of government in 1914.

The leading industries are printing houses, an oil refinery, sugar factories, box factories and (near the city) a pepper factory. About 200 ships sail annually from Baton Rouge loaded with oil for Europe. The state university, the state institutes for the blind and deaf and Southern University (negro state school) are located here. There are four banks, two hospitals, one local library and the university library. Population, 1910, 14,897; in 1917, 17,544 (Federal estimate).

BATRACHIANS, *ba tra'ke anz*, the name given originally to an order of animals between the snakes and fishes. The word is synonymous with *amphibia*. See Amphibians.

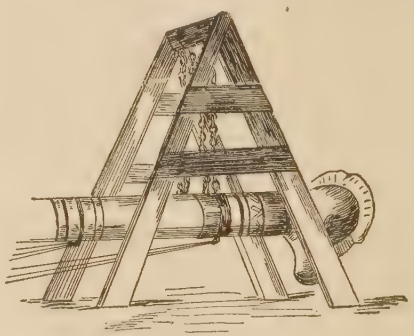
BATTALION, *ba tal'yun*, a military term referring to a unit in army organization. In the United States army a battalion consists of four companies of infantry, a total of about 1,000 men, under command of a major. There are three battalions in a regiment. The number of men in a battalion varies in different countries.

BAT'TENBERG, House of, a Prussian family which takes its name from a town in Hesse-Nassau. The line originated in the marriage of Prince Alexander of Hesse to the Countess von Hauke. In 1853 the Countess was created Princess of Battenberg, and her sons bore the title prince. The eldest son, Louis Alexander (1854–), became a naturalized British citizen, entered the royal naval service and became admiral of the fleet in 1912. Shortly after the outbreak of the World War he resigned, though loyal to England, to disarm criticism. In 1884 he married his cousin, Princess Alice, daughter of Queen Victoria.

The second son of Prince Alexander of Hesse, Prince Alexander of Battenberg (1857–1893), was called to the throne of Bulgaria in 1879, but in 1886, because of political disorders, he abdicated.

A younger brother of the foregoing, Henry Maurice (1858–1896), married Princess Beatrice, the youngest daughter of Queen Victoria. Their eldest daughter, Princess Victoria Ena, married Alfonso XIII of Spain in 1906.

BATTERING-RAM, a military device used in ancient days for battering down the walls of cities whose capture was desired. Two kinds of rams were employed; some were suspended in frames and others were movable on wheels or rollers. Each consisted of a beam or spar with a massive metal



BATTERING-RAM

head, and was set in motion either by a direct application of manual force or by means of cords passing over pulleys. Some are said to have been 120 feet or more in length and to have been worked by 100 men. One is described as being 180 feet long and having a head weighing 1½ tons.

BATTERY, a small unit of fighting men within a larger artillery unit of an army.

The members of a battery are engaged with heavy guns, both fixed and movable, larger, however, than machine guns. The latter are assigned to the infantry. Guns in a battery are mortars, howitzers and various guns on wheels, each drawn by horses or automobile tractors, or so large that they are built on specially-constructed railroad cars. Usually six guns comprise a battery.

BATTERY, Electric. See Electric Battery.

BATTLE, Trial by, or Wager of. During the Middle Ages, when a man was accused of a crime he might appeal to the court for the privilege of proving his innocence by fighting his accuser. It was believed that God would fight on the side of the man who was in the right, and thus the judgment was held to be absolutely just. If the accused or the accuser was a woman, she might choose a champion to fight in her stead. The custom was prohibited by law in 1819.

BATTLE CREEK, Mich., the city which "serves breakfast to the world," is in Calhoun County, twenty-two miles east of Kalamazoo and 165 miles and 121 miles, respectively, from Chicago and Detroit. It is on the Michigan Central and the Grand Trunk railroads. The city has over 175 manufacturing plants, the most important being those in which breakfast foods are prepared. More of these cereal foods are made here than in any other city in the world; it also manufactures more printing presses than any other city. It claims to be the first city in the world in the value of net factory output per capita of population.

For many years Battle Creek was a great Adventist headquarters. A vast sanitarium, established by them, is yet conducted, under the direction of Dr. J. H. Kellogg; it was rebuilt in 1903 at a cost of $600,000. The city also has a fine city hall and a modern six-story hotel. The commission form of government was adopted in 1913. The town was founded in 1832, and became a city in 1860. In 1917 a training camp for the new national army was established here, and named Camp Custer. Population, 1910, 25,267; in 1917, 30,159 (Federal estimate).

BATTLEFORD, Sask., at confluence of Battle and Saskatchewan rivers, on the Canadian Northern and Grand Trunk Pacific railroads, ninety miles west of Saskatoon. Spanning the rivers are six steel bridges. It is the chief town of a judicial circuit, has a land-title office, Dominion lands office and an elevator with 30,000 bushels capacity. The town is the home of the College of Saskatchewan and is the district headquarters of the Royal Northwest Mounted Police. The streets are ninety-nine feet wide. In the vicinity there is good fishing and hunting. Population, 1916, 1,500.

BATTLE HYMN OF THE REPUBLIC, a patriotic hymn written by Julia Ward Howe in 1861. Its rhythm corresponds to that of *John Brown's Body,* and it is always sung to that melody. Early in the Civil War Mrs. Howe went to Washington to witness a review of the Federal troops, and at that time she received the inspiration for the hymn. She says in this connection:

> "The road was so filled with soldiers that our return from the parade grounds was very tedious, and to pass the time away we sang John Brown's Body. Some of the marching regiments took it up and it was passed along the road until the echoes reverberated for miles. My pastor asked me why I did not put the spirit of the song into some gracious and expressive words. I told him I had tried. One morning soon after that I awoke suddenly, and the lines I wanted were running vaguely through my mind. I arose and put them down. They were published in the Atlantic Monthly, and the editor named it "The Battle Hymn of the Republic."

Below are given two stanzas of the famous song:

Mine eyes have seen the glory of the coming of the Lord;
He is trampling out the vintage where the grapes of wrath are stored;
He has loosed the fateful lightning of his terrible, swift sword—
His truth is marching on.

In beauty of the lilies Christ was born across the sea,
With a glory in his bosom that transfigures you and me;
As he died to make men holy, let us die to make men free,
While God is marching on.

BATTLE OF THE NATIONS. See Leipzig, Battles of.

BATTLESHIP. See Warship.

BATUM, or **BATOUM**, *ba toom′*, a port in Transcaucasia, on the eastern coast of the Black Sea, granted to Russia by the Treaty of Berlin in 1878. The harbor is one of the best on the east coast of the Black Sea, and previous to the World War Batum was the chief commercial center in the region for the export of petroleum, wheat and manganese

ore. Its importance as a naval and military station to Russia was very great, as it has one of the strongest positions on the Black Sea. After the conclusion of peace between Russia and Germany in 1918, the port was occupied by Turkish troops, but they were later forced to abandon it. Population, 1911, 30,008.

BAUCIS, *baw'sis,* and **PHILEMON,** *fil'e mon,* an aged couple with whom a famous old myth was connected. One evening Jupiter and Mercury, who were visiting the earth in disguise and had been driven from an inhospitable village, came, beyond the bounds of the village, to the cottage where Baucis and Philemon lived. The strangers, although unrecognized, were kindly received and were given the best that the cottage afforded. While they were at supper, Baucis and Philemon observed, to their great amazement, that the pitcher from which the milk was poured was constantly refilled as soon as empty. This showed them the divine character of their guests.

BAUXITE, *bohks'ite,* the most important mineral from which aluminum is obtained. Its contents are between one-fifth and two-fifths aluminum. It has a coarse, granular structure and is of various colors. It occurs in claylike deposits and is usually mixed with a greater or less proportion of oxide of iron. Large deposits are found in Ireland and in the United States in Arkansas. Lesser deposits are found in Alabama and Georgia. The American deposits are pure and well suited to the production of aluminum. See ALUMINUM.

BAVARIA, in German, BAYERN, formerly a kingdom of the German Empire, next to Prussia the largest state in Germany. It is divided into eight small government districts, of which Upper Bavaria (6,454 square miles) is the largest, and the Palatinate (2,289 square miles) is the smallest. The other divisions, in order of size, are Lower Bavaria, Upper Palatinate, Upper Franconia, Middle Franconia, Lower Franconia and Swabia. The area of the entire state is 30,346 square miles; the population before the World War was 6,887,291 (1910). The last king, Ludwig III (born 1845), ascended the throne in 1913; in November, 1918, during the revolutionary uprising, he abdicated.

Surface and Drainage. Nearly all of the boundary lines are formed by mountain ranges, and the country is generally mountainous or hilly. The interior is a plateau having an average elevation of 1,600 feet and gradually sloping toward the north. Rhenish Bavaria is traversed by the Harz Mountains, which have an elevation of over 3,200 feet. The country is drained by the Danube, which traverses it from west to east and receives as tributaries the Iller, Lech, Isar and Inn from the south, and the Warnitz, Althmul, Naab, Regen and Vils from the north. The Main and its tributaries drain the northern part. In the southern part are numerous mountain lakes famed for the beauty of their scenery.

Natural Resources. The important minerals are coal, iron, salt and graphite, but most attention is given to the mining of coal and iron. The World War greatly increased these activities. Agriculture is the leading industry, and Bavaria was the most important agricultural state of the empire. There are many agricultural associations, through which the farmer's work is organized. These assist in the purchase of seed, agricultural machinery, and in the marketing of products and other movements tending to the farmer's prosperity. The most important crops are rye, wheat, barley, oats, potatoes, hay and grapes. The raising of live stock is also an important industry, and some of the best breeds of cattle found in the world are produced in Bavaria. About one-fourth of the country is covered with forests, all of which, whether belonging to the state or to private individuals, are under the supervision of the government.

Manufacture and Trade. Bavaria is the largest beer-producing country in the world, and beer is its most important manufactured product. Other leading manufactures are linens, woolens, cottons, leather, paper, glass, iron ware, jewelry and scientific instruments.

The leading exports are beer, textiles and scientific instruments. The imports are food products and manufactures. The chief cities are Munich, the capital, and Augsburg, Nuremberg, Wurzburg and Ratisbon.

History. Bavaria was the home of the Celtic tribes known as the Boii, and was for a long time a Roman province. During the reign of Charlemagne it came under the sway of the Franks, and after his death it was ruled by lieutenants having the title of margrave. In the latter part of the twelfth century the country came under the rule of the Wittelsbach family, which, with few interruptions, continued to rule to the year

1918. Bavaria opposed the movement towards a united Germany under the leadership of Prussia, and in 1866 sided with Austria in the Austro-Prussian War. As a result it was compelled to cede a portion of its territory to Prussia and to pay a large indemnity. It also entered into an offensive and defensive alliance with Prussia, and this compelled it to side with Prussia in 1870 in the war with France. On the conclusion of this war it took a leading part in the formation of the German Empire. In the World War Bavaria was second in importance to Prussia in military strength, but the relations between the two states were far from cordial, and after the signing of the armistice (November, 1918), there were threats of secession on the part of the Bavarians. The Bavarian state, which deposed its king and set up a republican form of government, sent representatives to the constitutional assembly which met in Weimar in February, 1919, but a serious uprising occurred while the assembly was in session. Late in February the Bavarian revolutionary Premier, Kurt Eisner, was assassinated by a reactionary count, and immediately after Spartacan (radical Socialist) revolts broke out in various sections. See GERMANY.

BAXTER, RICHARD (1615–1691), an English nonconforming clergyman, author of a religious treatise that was long influential in England and America, entitled *Saints' Everlasting Rest.* He was ordained in 1638, and in 1640 he became a parish clergyman. On the breaking out of the Civil War he went to Coventry and ministered to the garrison, and later he was chaplain in one of the regiments. At the Restoration he became king's chaplain. Among other treatises Baxter wrote *Call to the Unconverted.*

BAY, the name, rightly, of the laurel tree, noble laurel, or sweet bay; but the term is often loosely given to many similar trees and shrubs. A fatty oil, used in veterinary medicine, and a volatile oil are obtained from the berries. Superstitions have always been connected with the bay tree. In England the leaves are used in Christmas decorations, and they were once thought to be a safeguard from lightning. Sprigs of laurel or bay were in ancient times worn as a signal of victory. See LAUREL.

BAYA, *bah'ya,* an interesting weaver bird which lives in the East Indies. It builds a nest resembling a bottle, which it suspends from the branch of a tree. The entrance is from beneath, and there are two chambers, one occupied by the male and one by the female. The baya is a very intelligent bird, is easily tamed, and is often taught by the natives to fetch and carry and do other entertaining tricks.

BAYARD, PIERRE DU TERRAIL, known as CHEVALIER BAYARD, (1476–1524), was a French knight, the model of all the virtues of chivalry. His valor, his generosity and his unblemished honor won for him the name of *Chevalier sans peur et sans reproche* (the knight without fear and without reproach). He served under the French kings Charles VIII, Louis XII and Francis I, and under all of them he achieved wonderful successes over the Italians, Spaniards and English. One of his most famous exploits was the defense of a bridge at Garigliano, in 1503, against the assaults of two hundred Spaniards. The brilliant victory at Marignano, 1515, was won largely through his efforts, and Francis I bowed before him after the victory to receive knighthood from him.

BAYARD, *bi'erd,* THOMAS FRANCIS (1828–1898), the leading statesman Delaware has produced. He was born in Wilmington, followed his father into the profession of the law, and was admitted to the bar at the age of twenty-three. Both father and son publicly denounced the Civil War, declaring both against secession and coercion. He became United States Senator in 1869, in succession to his father, and served until 1885, when he resigned to become Secretary of State under Cleveland's Presidency. In this post he distinguished himself in the Bering Sea controversy (which see) and in treaty making. From 1893 to 1897 he was ambassador to Great Britain.

BAY CITY, MICH., the county seat of Bay County, on Saginaw River, four miles from Saginaw Bay, an arm of Lake Huron. It has five railroads—the Michigan Central, the Pere Marquette, the Grand Trunk, the Detroit & Mackenac, and the Detroit, Bay City & Western. There is also boat connection with lake cities. Ship-building and the manufacture of wrecking cranes are important industries. Before Michigan banished saloons distilling was largely carried on. There are two public libraries, a fine city hall, a state armory and several small parks. The trade in lumber, once of first importance, is de-

creasing. The town was founded in 1836; it became a village in 1859 and a city in 1865. It absorbed West Bay City in 1905. Population, 1910, 45,166; in 1917, 48,390 (Federal estimate).

BAYEUX, *ba yo′,* **TAPESTRY,** a celebrated piece of embroidery of early medieval times, giving in a series of pictures the history of the invasion and conquest of England by the Normans. It is supposed to have been worked by Matilda, wife of William the Conqueror, and her attendants. It contains over 1,500 figures, with inscriptions in Latin; it is 230 feet long and about twenty inches high. The tapestry was found in the cathedral at Bayeux and is still kept in the library at Bayeux, having been preserved in a fine condition.

Bayeux is an ancient town in France, in the department of Calvados, sixteen miles northwest of Caen. It has a splendid cathedral and manufactures of lace, calico and porcelain. Population, 1911, 7,738.

BAYONET, *ba′o net,* a short, straight, swordlike blade about sixteen inches in length, attached to the end of a rifle barrel. Its earliest use was to repel cavalry charges, but later infantrymen not only used it for defense against horsemen but to impose a wall of steel against charging foot soldiers. In the World War soldiers used the bayonet with deadly effect in going "over the top" and clearing out the trenches of the enemy. The percentage of deaths from bayonet thrusts in that war was greater than from shell fire; by the spring of 1918 trench warfare gave way to open struggles, and in these the bayonet proved one of the deadliest of weapons. The first time bayonets were used was in 1671, in France.

BAYONNE, *ba yon′,* N. J., a city in Hudson County, on New York and Newark bays, and on the Lehigh Valley and the Central of New Jersey railroads. It is in a vast manufacturing district. The largest refinery of the Standard Oil is here, and is connected by pipe lines with New York, Philadelphia and Baltimore, which then continue to Baton Rouge, La. The city also has the main factory of the American Radiator Company. Scores of lesser factories are in the city. Population, 1910, 55,545; in 1917, 72,204 (Federal estimate).

BAYREUTH, or **BAIREUTH,** *bi′roit,* GERMANY, a town of Bavaria, on the Red Main, forty-one miles northeast of Nuremberg. The place is especially famous for the national theater, finished in 1875, which is used for the performance of Wagner's music dramas (see WAGNER, WILHELM RICHARD). A monument to Jean Paul Richter is one of the points of interest, and visitors are also directed to the old home of Wagner, with his grave in the garden. The principal industries are cotton spinning, sugar refining, the manufacture of musical instruments and brewing. Population, 1910, 34,547.

BAY RUM, a liquid prepared by dissolving the oil of bay in alcohol, diluting the solution with water and adding a small quantity of the oil of orange peel and of allspice. The oil of bay is obtained by distilling the leaves of a tree belonging to the myrtle family, growing in the West Indies. Bay rum is used for toilet purposes and in medicine as a liniment.

BAY WIN′DOW, a window forming a bay or projecting section of a room, and rising from the ground or basement on a plan rectangular, semioctagonal or semihexagonal, but always straight-sided. The term is, however, also often used to designate a bow window, which more properly forms a semicircle. When used in upper stories of houses such a projecting window is called an *oriel* window.

BAZAINE, *ba zane′,* FRANÇOIS ACHILLE (1811–1888), a marshal of France, an unfortunate victim of the military might of Prussia. He took part in the Crimean War and in the expedition to Mexico for the purpose of making Maximilian, archduke of Austria, emperor. In the latter part of the Franco-German War he had command of the main French armies, and after a succession of defeats he took refuge in Metz, which in October, 1870, he was obliged to surrender, with 173,000 men. He was tried by a court-martial and sentenced to be shot, but his sentence was commuted to twenty years' imprisonment. In 1874 he escaped from prison.

BAZAR, or **BAZAAR,** *ba zahr′,* in the East, an exchange or market-place, usually consisting of small shops or stalls in a narrow street or series of streets. A bazar is sometimes covered and sometimes open. Markets for the sale of miscellaneous articles, chiefly fancy goods, are now to be found in most European cities, bearing the name of bazars.

The term is also applied to a sale of mis-

cellaneous articles, mostly of fancy work, contributed gratuitously, in the furtherance of some charitable or other purpose.

BEACH, Rex (1877–), a popular American writer of stories that abound in lively action and vivid description. He was born at Atwood, Mich., and was educated for the law. Finding himself a successful magazine contributor, he abandoned the law and made a name for himself as a writer of adventure stories. One of his early books, *The Spoilers,* a dashing tale of life in Alaska, fully established his reputation, and was followed by such popular books as *The Barrier, Going Some, The Silver Horde, The Ne'er-do-Well, The Iron Trail, The Auction Block* and *Heart of the Sunset.* A number of these were dramatized for the moving-picture stage with marked success.

BEACONSFIELD, Earl of. See Disraeli, Benjamin.

BEAGLE, *be'gl,* a small hound, formerly kept to hunt hares, now displaced by the harrier, which sometimes is called beagle. The beagle is smaller than the harrier, compactly built and smooth-haired.

BEAM, a long, straight and strong piece of wood, iron or steel, used generally in an important place in a structure to support a weight. The term has several applications:

(1) In a balance it is the part from the ends of which the scales are suspended.

(2) In a loom it is a cylindrical piece of wood on which weavers wind the warp before weaving; also, the cylinder on which the cloth is rolled as it is woven.

(3) In a ship it is one of the strong transverse pieces stretching across from one side to the other to support the decks and retain the sides at their proper distance; a ship is said to be on her beam ends when lying over on her side.

(4) In a plow, the beam is the main piece to which the plow tails are fixed, and by which the plow is drawn.

BEAN, the seed of a number of annual plants that vary in form of growth from vines to short, stocky shrubs, and furnish mankind with a well-liked and nutritious vegetable (see Annuals). Beans are borne in pods and are of many different sizes, shapes and colors. All come from butterfly-shaped flowers. The *kidney* bean of Europe is the common bean of the United States and Canada, and many varieties of it are cultivated. Among these is the *navy* bean, used in preparing that most popular of New England dishes—"Boston baked beans."

Certain varieties of beans having tender, fleshy pods are grown in gardens and on truck farms for the pods, which are placed on the market as *string* beans. Other varieties such as the *cranberry* and *lima* beans, are harvested and used before the seeds are ripe. The lima bean is grown in large quantities in California, where it is either canned or dried before marketing. Another variety, the *soy* bean, is a common food in Japan and China, and has recently become important in the United States. Mexicans consume large quantities of a small dark-colored bean known as the *frijole.*

Beans are a very important food because of their high percentage of protein. Baked beans very well take the place of a meat dish, even for the heaviest meal of the day. Navy beans form one of the staple army foods, since they represent a maximum of nutriment in proportion to the cost. Like the pea, also a pod-bearing plant, the bean belongs to the pulse family, or leguminous plants (which see; see, also, illustration, in Botany).

Beans flourish best in a rich soil having a good proportion of clay but not a great amount of moisture. The plants are very tender and are injured by the lightest frost; therefore the seed should not be sown until all danger from frost has passed.

BEAR, a large shaggy beast of prey closely allied to the dog in structure and having many features in common with the badgers, weasels and skunks.

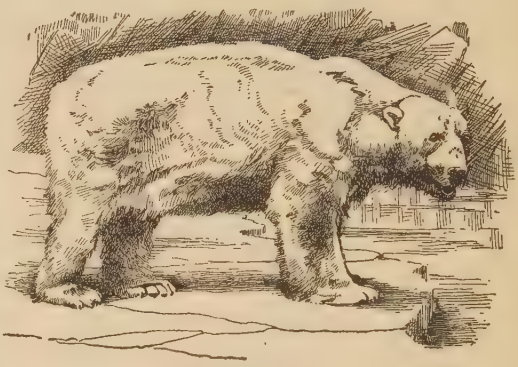
General Description. Bears have massive heads, extended narrow jaws and large teeth. The body appears more bulky than it really is, because of the looseness of the skin, the length of the coarse fur, the stumpy tail and the comparative shortness of the legs. The limbs are furnished with long and powerful claws for use in digging, fighting and climbing trees. The senses of hearing and smell are very well developed. Bears are clumsy in their movements; yet they can run rapidly, and most of them climb trees or scramble over rocks with remarkable speed. They usually make their home in some cave or crevice among rocks, or in hollow trees.

There, in the early spring, the young ones, usually two in number, are born. Each bear family usually keeps pretty well to itself, instead of hunting in packs as the wolves do. Bears will eat nearly all kinds of food. They are fond of fruits, berries, herbs, roots, eggs, ants and honey. They capture and devour small animals in the woods and often raid human settlements in search of young pigs, calves, colts and sheep. Almost all bears eat fish and reptiles, and some species live almost entirely on fish.

Kinds of Bears. The species are not numerous, and the family likeness is so marked in all that many of the members are difficult to distinguish from one another. The *polar bear* or *ice bear* of the Arctic region is decidedly different from all the others. It is exceptionally large, some specimens being nine feet or more in length. The color is a creamy white, except the claws, which are black. The head is long and pointed, the limbs slender and the feet large, and hairy on the soles. The *black bear* is the most widespread variety, being still found in all the great forest regions north of Mexico. It is not dangerous unless wounded or enraged. The *Florida* and the *Louisiana bears* closely resemble the black bear. The *barren-ground bear,* a large brownish-white species, lives on the brushy plains northwest of Hudson Bay.

The *grizzly bear* of the mountains of Western North America is one of the largest and most savage of the family. Though not quarrelsome, it is easily enraged, and then fights with terrific energy. It formerly was found from the Black Hills of Dakota westward, and from Mexico to Northern Alaska, but has been driven by the advance of civilization to remote mountain and forest solitudes. The color ranges from gray to reddish-brown, those of the latter color being known as *cinnamon bears,* of the former, as *silver-tips.* Some weigh one thousand pounds. Formerly they were the enemies of the buffalo and deer, and now they sometimes prey upon cattle and horses of western ranches. Unlike other bears, they do not hibernate long, and they hunt for food by day and night. The *Kadiak bear* is so called from its home on Kadiak Island, Alaska, where it was discovered in 1895. The largest known specimen of bear was a Kadiak weighing two thousand pounds, but the Kadiaks are, however, usually smaller than the grizzlies. The color varies from a yellowish to a dark brown.

GRIZZLY BEAR



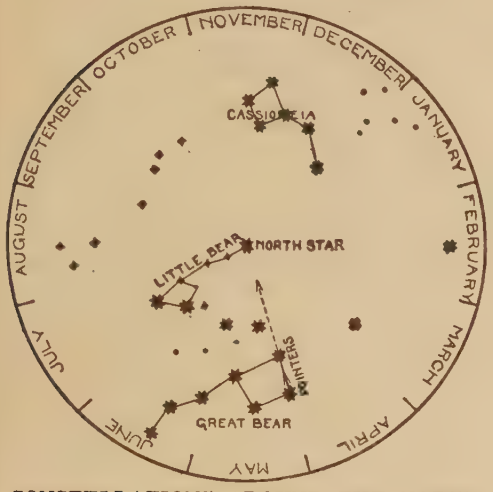
POLAR BEAR

Of the bears of the Old World, the best known species is the *brown bear* of Northern Europe and Asia. This is the bear most often seen in menageries, as it can be easily tamed and taught to dance and perform various tricks. Other Old World bears are the *Himalayan* and *Japanese black bears,* the *black sun-bear* of the Malayan Peninsula and neighboring islands, and the *sloth-bear* or *honey-bear* of India and Ceylon.

The pelt of bears is much valued for furs, overcoats and rugs, and is becoming very expensive, owing to its rarity. The flesh is used for food in some parts of the world, and the fat and claws are valuable.

BEAR, GREAT, the group of stars called *Ursa Major* or *Great Bear* by the ancient Greeks. The seven bright stars of the constellation form a dipper-shaped figure, from which it takes, in the United States and elsewhere, the common name *Big Dipper.* The two stars which form the front of the dipper are called the pointers, because a line drawn from the bottom star through the top one

will, if continued, pass so near the North or Pole Star that it is easy to locate it. The *Lesser Bear* or *Little Dipper* is the constellation in which the Pole Star is located. These two constellations, with Cassiopeia and several others, are always visible in the



CONSTELLATIONS AROUND THE NORTH STAR

northern heavens, where they appear to move around the North Star. The accompanying diagram shows the relative position of the principal constellations. Hold it with the month at the top and it will be nearly correct at eight o'clock in the evening.

BEAR AND BULL, terms frequently used in the buying and selling of stock on the stock exchange and grain on the board of trade. *Bear* is the term applied to one who attempts to lower the price of the stock or grain, and *bull* to one who attempts to raise the price. It is evident that those who wish to buy are the bears, and those who wish to sell, the bulls. To "bear stock" or to "bull stock" are phrases in common use. See BOARD OF TRADE.

BEAR'BERRY, an evergreen shrub of the heath family, growing on the barren moors of Scotland, Northern Europe, Siberia and North America, where its berries afford food for the grouse and other wild fowl. The leaves are used in medicine as a tonic.

BEARD, *beerd*, the hair upon the chin, cheeks and upper lip, which in the human family appears as a distinctive mark of the male sex. Styles in beards frequently change, conforming to the style of beard worn by an extremely popular man. Thus when William McKinley was President of the United States many shaved their faces clean, following the style affected by him. Sometimes whole nations follow a custom with respect to beards, as in Russia, where there are few beardless men over the age of forty.

Slaves in ancient times, were deprived of their beards, and with the Turks even now the attendants in the palace of the sultan have shaven faces. The intense love of cleanliness on the part of Egyptians would not suffer them to wear a beard, save, according to Herodotus, in times of mourning. Among the early Greeks a thick beard was considered a mark of manliness, and the Greek philosophers thought that a certain dignity of character attached to its long growth. Shaving was introduced into Greece by Alexander the Great, who ordered his soldiers to shave in order that their enemies might not seize them by the beard, and the practice continued general to the time of Justinian. During medieval and modern times the custom has changed from time to time in different countries, from whiskered or mustached faces to clean-shaven. In the American Civil War nearly all soldiers wore beards; in the World War all American and British soldiers in France kept themselves beardless.

BEARD, DANIEL CARTER (1850–), credited with the first organization of what has developed into the Boy Scout movement, is an American artist, writer and naturalist. He was born in Cincinnati, O., studied art in New York City and became an illustrator for books and magazines. He is scout commissioner (1919) of the Boy Scouts of America (see BOY SCOUTS). Mount Beard, close to Mount McKinley in Alaska, was named for him. Beard is the author of the recent books, *Shelters, Shacks and Shanties; Handicraft and Recreation for Girls; What a Girl Can Make and Do; Things Worth Doing and How to Do Them.*

BEAR LAKE, GREAT. See GREAT BEAR LAKE.

BEATRICE, *be'a tris*, NEB., the county seat of Gage County, on the Big Blue River, which the town has utilized for water power, and on the Chicago, Burlington & Quincy, the Union Pacific and the Chicago, Rock Island & Pacific railroads. Nurseries, a cold storage company, iron works, and flour mills represent large business activities. A new Y. M. C. A. building was planned in 1917

to cost $125,000; a Federal building was built in 1892 and has since been enlarged; a court house cost $150,000, and a new high school cost $100,000. The Athletic Park is the city's playground. Near the town is the state institution for feeble-minded youth. The place was settled in 1857 and became a city in 1873. The commission form of government was adopted in 1912. Population, 1910, 9,356; in 1917, 10,437 (Federal estimate).

BEATRICE PORTINARI, *por te nah're*, (1266–1290), the poetical idol of Dante, the daughter of a wealthy citizen of Florence and wife of Simone dei Bardi. She was but nine years of age when Dante met her first at the house of her father. He saw her only once or twice throughout his life, and she probably knew little of him. The story of his love is recounted in the *Vita Nuova* ("New Life"), and she has an important place in the *Divine Comedy*.

BEATTY, *be'a ti*, Sir David (1871–), a British naval officer who won honors and renown during the World War. He entered the navy at the age of thirteen, and by 1898 had attained the rank of commander. At the outbreak of the World War he was commander of the first battle cruiser squadron, with the rank of rear-admiral. During the first month of the war (August, 1914), he led a British fleet into the bight of Helgoland and engaged a part of the German fleet, sinking three German armored cruisers and two destroyers. He was raised to the rank of vice-admiral in 1915, and in May of the following year carried off chief honors in the naval Battle of Jutland. In December, 1916, he succeeded Sir John Jellicoe as commander in chief of the grand fleet. Sir David was married in 1901 to Miss Ethel Field, the oldest daughter of Marshall Field of Chicago.

BEAUMARCHAIS, *bo mahr shay'*, Pierre Augustin Caron de (1732–1799), a French wit and dramatist. His proficiency in music was such that he was made music-master to the daughters of Louis XV. He first distinguished himself by his *Memoires*, or statements in connection with a lawsuit, which by their wit, satire and liveliness entertained all France. In 1775 appeared a comedy, *The Barber of Seville*, and its success was immediate and great. With its sequel, the *Marriage of Figaro*, it has given Beaumarchais a permanent reputation as the most important dramatist of the eighteenth century in France. Rossini's popular opera, *The Barber of Seville*, is based on the comedy of the French wit. Beaumarchais was instrumental in securing aid for the American colonies from France, during the Revolutionary War.

BEAUMONT, *bo'mont*, Francis (1584–1616), and **FLETCH'ER**, John (1579–1625), two eminent English dramatic writers, contemporaries of Shakespeare, and the most famous of literary partners. In all, the works which bear their names number over fifty, and it is impossible to discover just what share each had in these productions. Certain of the plays, however, as *Philaster* and *Maid's Tragedy*, we know were largely Beaumont's, while *The Faithful Shepherdess* is mostly Fletcher's. Their dramas, which in their day are said to have been preferred to Shakespeare's, have little powerful character drawing, and are greatly marred by coarseness. They are, however, extremely clever and they contain some of the most musical lyrics in the English language.

BEAUMONT, *bo'mont*, Tex., a rapidly-growing city in Jefferson County, of which it is the county seat. It is twenty-eight miles from the Gulf of Mexico and eighty miles northeast of Houston, on the Gulf, Colorado & Santa Fe, the Gulf & Interstate, the Kansas City Southern, the Texas & New Orleans, and the Beaumont, Sour Lake & Western railroads. What has given the city great advantage is its location on the Neches River. The Sabine-Neches Canal connects with the Gulf, and the deepening of this waterway, at a cost of a million dollars, made Beaumont an ocean port.

The city has a vast lumbering, rice and oil district tributary to it, and these three industries are paramount. However, ship building has become very important. The place was settled in 1828 and became a city in 1899. Population, 1910, 20,640; in 1917, 28,851 (Federal estimate).

BEAUREGARD, *bo're gahrd*, Pierre Gustave Toutant (1818–1893), the Confederate officer who gave the command to fire on Fort Sumter. He was born in New Orleans, studied at West Point and left it as artillery lieutenant in 1838. He served in the Mexican War, but when hostilities between the North and the South were imminent he joined the Confederates, giving up his position as superintendent of the military academy at West Point. Beaure-

gard began the war by the bombardment of Fort Sumter, gained the first Battle of Bull Run, lost that of Shiloh, in spite of most determined resistance, assisted in the defense of Charleston, opposed Sherman's march to Atlanta and aided Lee in the defense of Richmond. In April, 1865, he surrendered to General Sherman. After the war he served as adjutant-general of Louisiana and president of the New Orleans, Jackson & Mississippi railroad.

BEAVER, *be'ver*, a small, furbearing animal, whose industry has passed into a proverb and has been the subject of many literary allusions. "As busy as a beaver" is a compliment to a man and a tribute to this little gnawing animal. The beaver was once common in all northern latitudes, but trappers have preyed incessantly upon it for its valuable fur, and it is now necessary to protect it by law in Canada in certain seasons.

The beaver usually lives in colonies, but it occurs solitary in central Europe and Asia. It has short ears, a blunt nose, small forefeet,

THE BEAVER

large webbed hindfeet and a flat tail covered with scales on its upper surface. The food of the beavers consists of the bark of trees, leaves, roots and berries. Their favorite haunts are rivers and lakes which are bordered by forests. In winter they live in houses, about three feet high and seven feet across, substantially built of branches of trees and of mud, on the water's edge so that the entrance can be under water. These dwellings are called beaver lodges, and each accommodates a single family. The teeth of beavers are very strong, and they cut down quite large trees by gnawing around them. The trees are felled for food, and also that their branches may be used in building their houses. Beavers are most peculiar, in that sometimes many families work together in communities practically as one. If the stream on which they have located is not deep enough, or if the water does not cover land enough for them, the colony will unite and build an ingenious dam of wood, stones and mud across the stream. In the pond thus created, each member has its own home. The beavers hold among animals somewhat the same position the bees have among insects, in this remarkable instinct of working in common.

The fur of the beaver is worth from $5 to $25, as it comes from the trapper, the price depending upon its quality.

BEBEL, *ba'bel*, Ferdinand August (1840–1913), a German socialist writer and leader, who based his theories on those of Karl Marx. His keen intellect, organizing talent and oratorical ability made him the natural leader of his party in the Reichstag, to which he was elected in 1871, and of which he remained a member, except for a brief period, until his death. The measures he advocated, regarded as radical in some respects, led to repeated imprisonment, but he is now classed among conservative socialists. Under his leadership, the Social Democratic party in Germany has become very strong. His well-known works include *Woman and Socialism; Woman in the Past, Present and Future,* and *My Life,* an autobiography.

BECHUANA, *be chwah'nah,* a race inhabiting the central region of South Africa north of Cape Colony. They belong to the Bantu family and are divided into tribal sections or sub-kingdoms. They live chiefly by husbandry and cattle-rearing and work with some skill in iron, copper, ivory and skins. The impositions of the Boers and others led them to seek British protection. From 1878 to 1880 South Bechuanaland was partly administered by British officers, and in 1885 a great part of the rest of Bechuana territory was brought under British influence. British authority is now absolute throughout Bechuanaland, as the territory of the Bechuanas is called.

BECKET, Thomas À (1118–1170), an Archbishop of Canterbury who figured in the struggle between the Church and royal tyranny. He was educated at Oxford and Paris and studied civil law at Bologna in Italy. On his return he was made archdeacon of Canterbury and provost of Beverly. In 1155 Henry II appointed him

chancellor, and preceptor to his son, Prince Henry. In 1162 Becket was consecrated archbishop, gave up his luxurious habits and became a zealous champion of the Church, liberal only in charities. A series of bitter conflicts with the king followed, ending in Becket's flight to France. A reconciliation having taken place in 1170, Becket returned to England, resumed his office and renewed his defiance of the royal authority. A rash hint from the king induced four barons to go to Canterbury and murder the archbishop while he was at vespers in the cathedral, December 29, 1170. He was canonized in 1172, and the splendid shrine erected at Canterbury for his remains was a favorite place of pilgrimage. Chaucer's *Canterbury Tales* are told by a party of men going on a pilgrimage to this shrine.

BECKY SHARP, the outstanding character in Thackeray's *Vanity Fair,* one of the most strikingly-portrayed heroines in English fiction. She is introduced to the reader in the opening chapter as an orphan teacher in a genteel boarding school for girls. She leaves this establishment to take a position as governess in the home of Sir Pitt Crawley, and incidentally to make her way in the world. By means of native ingenuity, cleverness and a gift for intrigue the little adventuress works her way into society and succeeds in maintaining an expensive establishment on "nothing a year." She marries Rawdon Crawley, younger son of Sir Pitt, but late in the story is deserted by him because of her duplicity in connection with the evil Lord Steyne. Becky is depicted in the last chapter as having lost most of her friends, but with plenty of money and a damaged reputation. This character was vividly presented by Mrs. Fiske in a stage version of the novel.

BED, a place or piece of furniture upon which one sleeps. Savages sleep on the ground or on beds made of leaves or the skins of animals. The Hindus use a light mattress for a bed. The Japanese lie on padded layers of bedclothing and use a wooden head rest which closely fits the neck, and the Chinese make their beds by spreading rugs or matting on the floor or ground. In the Philippines a taut piece of rattan stretched on a frame serves as a bed, the whole being enclosed in a mosquito netting.

The ordinary beds used in Europe and America are raised on a bedstead and are furnished with springs, mattress, comforters, sheets and pillows. Besides the ordinary bedsteads of iron or wood, there are many varieties of the old-fashioned folding bed. Bookcases, tables, chests and couches of various sorts are converted into beds at night in apartments where space is limited. Another modern development is the bed which is kept in a recess in the wall by day, or is clamped to a door that swings on a pivot.

BED, in geology, a stratum or layer of rock of varying thickness. It may consist of a number of thin layers, or *laminae,* of a single stratum having considerable thickness, or of several strata taken together. The last is usually termed a *formation.* A very thin bed is called a seam. See GEOLOGY.

BED'BUG, an offensive insect about three-sixteenths of an inch long, with a roundish, flat body and rusty color. When touched it emits an unpleasant odor. The female lays her eggs in summer in the crevices of bedsteads, furniture and the walls of a room. The larvae are small, white and semitransparent, and grow to full size in about eleven weeks. The bedbug is fond of human blood, but thrives on other substances. To exterminate this pest paint cracks and other places where they hide with corrosive sublimate dissolved in wood alcohol, or use hydrocyanic acid gas. The latter is recommended by the United States Agricultural Department. Both substances are deadly poisons and must be used with care.

BEDE, *beed,* or **BAEDA**, *be'da* (about 672–735), known as *The Venerable,* the most learned Englishman of his day, whose chief work, *Ecclesiastical History of England,* won him the title *"Father of English History."* He was educated at Saint Peter's monastery, Wearmouth; took deacon's orders in his nineteenth year at Saint Paul's monastery, Jarrow, and was ordained priest at thirty. Bede wrote, besides the *History,* hymns, books on grammar, Biblical comments, etc. He died while dictating a translation of *Saint John.*

BEDFORD, IND., the county seat of Lawrence County, sixty-five miles southwest of Indianapolis, on the Chicago, Indianapolis & Louisville, the Baltimore & Ohio Southwestern, and two minor railroads. It is famous as the center of a stone quarrying region, whose product is shipped all over the United States for building purposes. The city has railroad shops. Population,

1910, 8,716; in 1917, 10,613 (Federal estimate).

BED'LAM, a corruption of *Bethlehem*, the name of a religious house in London, which was converted into a hospital for lunatics. The original Bedlam stood in Bishopsgate street. The lunatics were at one time treated little better than wild beasts, and hence the word *bedlam*, came to be typical of any scene of wild confusion.

BED'LOE'S ISLAND, an island in upper New York Bay, one and one-half miles southwest of the southern extremity of Manhattan Island, named for a former owner. It was given to the United States government for the purpose of harbor defense, and on it now stands the famous colossal Statue of Liberty, given by France to the United States. See LIBERTY, STATUE OF.

BEDOUINS, *bed'oo inz*, an Arabic word meaning *children of the desert*, refers to a people of Arab origin, mostly Mohammedans, inhabiting chiefly the deserts of Arabia, Syria, Egypt and North Africa. They lead a wandering existence in tents, huts, caverns and ruins, associating in families under sheiks, or in tribes under emirs. They are shepherds, herdsmen and horse-breeders, varying the monotony of pastoral life by raiding one another and by plundering unprotected travelers, whom they consider trespassers. They are ignorant of writing and books, their knowledge being purely traditional. In stature they are undersized, and though active, they are not strong. The ordinary dress of the men is a long shirt, girt at the loins, a black or red and yellow turban for the head, and sandals. The women wear loose drawers, a long shirt and a large dark-blue shawl covering the head and figure.

BED'SORE. A person long confined to bed and unable or not permitted to change position may develop sore spots on the body at the points of closest contact with the bed clothing. The skin becomes inflamed; possibly ulcerations may appear, in spite of every effort at cleanliness of the patient. Sponging with alcohol tends to harden the skin and render it more resistent to pressure. Whenever possible, in cases of long confinement, an air bed should be used; even small air cushions are serviceable and greatly allay the severe burning and intense pain which attend serious cases. There is little likelihood of trouble if a patient can move freely.

BEE, a common insect of which the honeybee and bumblebee are the best known species. There are probably not less than 5,000 species scattered over all parts of the world, but they are especially numerous in the tropics. Bees naturally divide themselves into two classes: solitary bees, which live in pairs, and those which live in colonies or societies. The carpenter-bee and mason bee are good representatives of the first class.

The Honeybee. The honeybee has always been regarded as the most intelligent of insects, and it has been partially domesticated from the earliest times. Honeybees live in large colonies or societies, numbering from 10,000 to 60,000 individuals. In bee culture such a colony is known as a *swarm*. In every swarm there are three kinds of bees: the *queen*, which is the female bee that lays the eggs from which the colony is born; the males or *drones*, so called because of the low humming sound which they make, and the *workers*, which are by far the largest number. There is only one queen to a swarm, and the males may number several hundred, but at a certain season every year most of these are stung to death by the workers, who with the queen are provided with stings.

LEAF-CUTTING BEE

It is upon the workers that the real strength of the swarm depends. They are the smallest, strongest and most active of the three classes. The queen during the season may lay as many as 300 eggs in a single day, but in cold weather the number is much less. From the

eggs first laid come the workers, and from the later ones, drones. The eggs are deposited in cells prepared by the workers, one to each cell. One set of cells is constructed for workers and another for drones and the queen never makes a mistake in depositing the eggs. The eggs which are to develop into queens are laid in cells much larger than the others, but they will not differ from those laid in the other cells, and the queen is developed by feeding the larva on a special food.

The eggs are about one-twelfth of an inch long, of a bluish color and oblong in shape. They hatch in about three days. The larvae are fed by the workers for about five days, the food consisting of honey and pollen, called *beebread*. When the larva has grown so as to fill the cell, the workers seal it up and leave it for about two weeks, when the bee comes forth in the adult state. As the swarm becomes too large for the home in which it lives, a new queen is allowed to appear, and in a short time after this, on a bright, warm day, the old queen leaves the hive with a large portion of the swarm and seeks a new home for herself or enters one that the bees have found beforehand. In one season as many as three successive swarms may leave the same colony. During the winter the bees remain asleep, move about but little and eat little food.

Bees obtain their food by entering flowers and sucking up and swallowing the nectar, which is stored in the stomachlike honeybag. The hind legs are also provided with little cavities, called baskets, in which the bees store pollen for transit to the home. The bee, after gathering what pollen and honey it can carry, rises into the air, flies in a circle for a few times around, then, having found its bearings, flies home in a perfectly straight line; hence the expression *bee line*. Bee hunters take advantage of this habit to locate swarms and stores of honey.

On entering and leaving the flowers, bees get dusted with pollen, and as it is their habit to work but one species of flower at a time, they are important agents in the cross-fertilization of flowers; in fact, such plants as clover cannot be successfully grown without the aid of bees.

Bees are liable to be destroyed by the larvae of a moth which enters the hives at night and lays its eggs. The larvae burrow out through the cells and sometimes kill an entire swarm. Occasionally in winter mice find their way into the hives and feed upon the bees and honey. Lice and several species of flies and birds also destroy bees.

Bee Keeping. Bee keeping is an important industry in many parts of the United States. The bees are kept in well protected hives fitted with removable frames in which the bees may build their comb and store their honey. They are so constructed that the bees will be protected from the cold during the winter, and at the same time receive sufficient ventilation. The industry is also made more profitable if sweet clover, buckwheat and other plants from which desirable honey can be obtained are raised in considerable quantities in the vicinity of the place where the apiary is located. When the comb is filled with honey and sealed, the frames are taken out and the honey is extracted. The empty comb is then returned to the hive to be again filled. The usual method of extracting is to shave off the cap of the cells with a knife and set the frame in a machine that revolves rapidly. This throws out the honey and leaves the comb unbroken. Some of the best grades of honey are sold in the comb, in which case they command a higher price.

Suggestions for Study. The general suggestions for lessons on insects and the special directions for studying the fly should be consulted, and used as a basis for the study of the bee. There is the obvious difficulty that small children should not be allowed to handle bees. In small classes the teacher may need only a single specimen, which all the pupils may study together. In larger classes, especially if the children are older, they may be divided into groups. For class-room work a dead bee will be fully as useful as a live one. Extreme care should be taken that none of the children is exposed to the dangers of a sting. If a neighoring bee keeper happens to have an empty hive he will probably be glad to show it to the class, so that they may study something more than the anatomy of the bee. The opportunities offered and the good judgment of the teacher or parent must determine how extended the study may be. The following outline and questions have been prepared to help both pupil and the teacher to gain a thorough knowledge of the bee and its habits.

Related Articles. Consult the following titles for additional information:

Apiary	Honey
Bumblebee	Insects
Carpenter bee	Mason bee

HONEYBEE

1, Italian Queen Bee.
2, Italian Worker.
3, Italian Drone.
4, Sealed Honeycomb.
5, Worker Cells.
6, Drone Cells.
7, Two Queen Cells.
8, Wild Plum.
9, Wild Crab Apple.
10, Basswood.
11, White Clover.

Outline on the Bee

I. General Description
- (1) Insect
- (2) Characteristics
  - (a) Hind feet dilated
  - (b) Hairs of the head feathery
  - (c) Tongue adapted to sucking liquids
- (3) Habits
  - (a) Feeding
    - (1) Larvae
    - (2) Adult
  - (b) Use of their senses

II. Classification
- (1) Solitary
  - (a) Carpenter
  - (b) Digger
  - (c) Cuckoo
  - (d) Leaf-cutter
  - (e) Mason
  - (f) Potter
  - (g) Parasites
- (2) Social
  - (a) Bumblebee
  - (b) Honeybee

III. Solitary Bees
- (1) Only perfect males and females
- (2) No wax-making power
- (3) Nests
  - (a) Many burrow in the ground
  - (b) Hollow stems of shrubs or dry wood
  - (c) Earthen cells above ground

IV. Social Bees
- (1) Bumblebees
  - (a) Classes
  - (b) Live in communities
    - (1) Only for a season
    - (2) Female founds new colony each spring
    - (3) Seldom over 200 in a colony
  - (c) Males die during winter
  - (d) Only enough honey for the season's needs
- (2) Honeybees
  - (a) Classes
    - (1) Queen
      - (a) Largest body
      - (b) Fully developed
      - (c) Lays eggs
    - (2) Male or drone
      - (a) Smaller than the queen
      - (b) Dies or is killed by the workers
    - (3) Worker
      - (a) Undeveloped female
      - (b) Smaller body than male and queen
      - (c) Largest class
      - (d) Gather the honey
      - (e) Feed the young
      - (f) Rulers of the hive
  - (b) Nest
    - (1) Made of beeswax
    - (2) Divided into cells
      - (a) For queens
      - (b) Drones
      - (c) Workers
  - (c) Eggs
    - (1) Laid by the queen
    - (2) Size
    - (3) Shape
    - (4) Color
    - (5) Hatch in three days
  - (d) Organization of a colony
    - (1) Controlled by workers
    - (2) Dependence of the other classes
    - (3) Swarming and formation of new colonies

Questions on the Bee

To what great class of animals does the bee belong?

About how many species of bees are known?

What are the two great divisions?

To which division does the bumblebee belong?

What is a swarm?

What is a drone? Why so called?

What is a worker? What are its functions?

How long does it take for the eggs to hatch?

How many queens are there in each swarm?

Which is the most numerous class of bees?

BEECH, a tree of the forest, of which there are two principal species—the American beech, growing to a height of fifty to eighty feet, and the European, which sometimes reaches 120 feet. It is a beautiful tree, with symmetrical branches and thin leaves in summer, and smooth, grayish bark in winter. Beech wood, of a reddish brown color, is desirable for firewood, as it gives quick and intense heat, but for building purposes it has been found short-lived, for it is liable to decay. For making many small articles, however, it has its commercial use. It is durable under water, therefore piles are often made from it.

The fruits, small three-sided nuts, when dried and powdered, may be made into a wholesome bread; they have also occasionally been roasted and used as a substitute for coffee. They yield a sweet and palatable oil, used by the lower classes in some parts of Southern Europe instead of butter, but they are, however, chiefly used as food for swine, poultry and other animals.

BEECHER, Henry Ward (1813–1887), an American preacher, remembered as one of the most eloquent pulpit orators of his day. He was the third son of Lyman Beecher, and a brother of Harriet Beecher Stowe. Beecher was born in Litchfield, Conn. As a child he was diffident and sensitive, loved the ocean and was only prevented from going to sea by his admission to the church in 1826. When but eleven years old he defeated an opponent in a debate on Paine's *Age of Reason*. He showed marked talent as a debater in Amherst College, where he was graduated in 1834. Beecher studied theology under his father's instruction in Lane Seminary, for a time was pastor of a Presbyterian church in Lawrenceburg, Ind. (1837–39), and at the same time was connected with an anti-slavery paper in Cincinnati. From 1839 to 1847 he preached in Indianapolis, contributing articles to an agricultural paper. In 1847 he took charge of Plymouth Church, Brooklyn, where his congregation, noted for generosity and intelligence, heartily sympathized with him in his efforts for reform, especially in his work for abolition of slavery and for temperance.

HENRY WARD BEECHER

Beecher's opinion on all public questions was eagerly sought. He was original in treatment and choice of subjects for his sermons, and his delivery was eloquent, dramatic, pathetic and witty. In the matter of physical endurance he was a marvel. Tender-hearted and charitable himself, any form of injustice called from him bitter denunciations. As an after-dinner speaker he was without a peer, and his popularity as a lecturer was almost unprecedented. Among his famous orations was one on Robert Burns; another was on Fort Sumter.

He was a Republican and aided the cause of the party by pen and speech, taking part in the canvass of 1856, and speaking at many meetings through the country. Through his influence and addresses, opinion in England concerning the Civil War was materially modified. His last public address was in Chickering Hall, New York, February 25, 1887, in favor of high license. After he came to Brooklyn he contributed his *Star Papers* to the *Independent*, of which he became editor in 1861. He edited the *Christian Union*, which later became *The Outlook*, and was a frequent contributor to the *Ledger*. In *Plymouth Pulpit* are preserved the sermons preached from 1859 till his death. Among his many published works are a novel entitled *Norwood*, *Lectures to Young Men* and *A Circuit of the Continent*. He married, in 1837, Eunice White Bullard, author of *From Dawn to Daylight*.

BEECHER, Lyman (1775–1863), an American clergyman, two of whose children, Henry Ward and Harriet (Stowe), became more famous than himself. He was graduated at Yale in 1797 and in the following year was licensed to preach and accepted the pastorate of the Presbyterian church in East Hampton, L. I. A sermon on dueling, suggested by the duel between Alexander Hamilton and Aaron Burr, made a great impression, and he soon became one of the best known preachers of New England. From 1832 till 1851 he was president of the Lane Theological Seminary, Cincinnati, in which he was professor of theology, and from 1832 to 1842 was pastor of the Second Presbyterian church of Cincinnati. In 1835 Beecher was arraigned and tried for heresy by his presbytery, was acquitted by the general as-

sembly, and on the division of the Presbyterian Church into two factions, he joined the new school.

BEEF, the flesh of the ox or the cow, the principal meat food of the leading nations of the world, because it is one of the most nutritious of meats. Modern ingenuity has made it possible to send beef very long distances by refrigeration and as dried beef or corned beef, hence few civilized communities are deprived of it even when local supplies fail to meet demands.

The United States and Argentina, within recent years, have supplied a large European market, though for three years before the World War (1914) the former country had not sent a shipload abroad because home needs could not be met. With the disappearance of the great Western cattle ranges the raising of beef cattle has suffered a decline, though increase in population is responsible in part for the shortage. When the allied countries in the World War suffered for food, America ate less beef, and the allied peoples in Europe were supplied.

Most of the beef placed on the market in the United States comes from the great meat-packing establishments, where the animals are slaughtered. When dressed the carcass is divided along the line of the back into halves. These are usually divided to form quarters, in which form most of the beef reaches the wholesale and retail dealers. By them it is cut to suit their customers. Porterhouse, sirloin, prime, rib and round are the most valuable cuts (see illustration in article Domestic Science, subhead *Meats*). Only beef of the best quality is placed on the market as fresh meat. The inferior grades and the least valuable cuts from the best grades are made into canned meats or corned beef. Dried beef is from the best cuts and is made by first placing the fresh beef in a pickle, then smoking it and hanging it up to dry. Canned beef is cooked and then pressed into tin cans, which are soldered to make them air-tight. See Meat Packing.

BEEF, Extract of, a fluid preparation of beef made by extracting the juice from the meat, then evaporating the water from the extract. The process is carried on in large kettles with domeshaped covers. A quantity of meat is placed in a kettle, the lower half of which has an outer jacket. The space between this and the kettle proper is filled with water, which is heated to a high temperature. The heat extracts the juice from the meat. This is then drawn off and boiled for some time to expel the water; what remains is the thick, dark and pasty extract. This is then run through a mill to mix it thoroughly and give it a uniform thickness. It is then put up in small jars and is ready for the market. One pound of extract contains the nutriment of forty-five pounds of beef. Beef extract is used for making broth, beef tea and some kinds of soup.

BEELZEBUB, *be el'ze bub*, meaning the *god of flies*, was the supreme god of the Syro-Phoenician peoples, in whose honor the Philistines built a temple at Ekron. The origin of this worship is probably to be sought in the scourge of flies to which the hot plain of Philistia was subject. In the New Testament he is the chief of demons (*Matt.* X, 25).

BEER, the name given to a liquor which is not distilled but is the result of malting and brewing. In Germany beer is prepared with malt, hops and water, but in America and England it is made from any kind of grain that will ferment, such as barley, corn, etc. Barley is used principally.

The beer best known in America is called *lager* beer (from the German *lager*, meaning *storehouse*), because after brewing it is kept for at least two months in a dark storehouse, to ripen. Of late years, however, the period of ripening has been much shortened in most breweries. Beer contains an average of three to five per cent of alcohol.

The extent of the manufacture of beer can be judged from the figures for the United States alone. The amount of beer on which internal revenue taxes were paid for the fiscal year ending June 30, 1917, was 60,729,509 barrels—over half a barrel for each man, woman and child in the country. The internal revenue law of 1917 placed a war tax upon beer of $1.50 per barrel. In 1918 the production of beer was ordered reduced by the United States government, as a war measure, to conserve foodstuffs; later in the same year its production was ordered stopped after July 1, 1919, as a war measure, and its manufacture was ended for all time by the adoption of the Eighteenth Amendment to the United States Constitution, effective in January, 1920.

Related Articles. For the processes of beer manufacture, see Brewing. See, also, Ale.

BEERSHEBA, *be er'she ba*, meaning the *well of the oath*, was the place where Abra-

ham made a covenant with Abimelech, usually recognized as the southernmost limit of Palestine. It is now a mere heap of ruins near two large and five smaller wells, though it was a place of some importance down to the period of the Crusades. Southwest of the old town a new town has risen in recent years. During the World War Beersheba came into prominence as one of the objective points in the British campaign against Jerusalem, and in October, 1917, it was captured by a force under General Allenby.

BEES'WAX, a wax secreted by bees and obtained from the honeycomb. The process by which it is made is not well understood. It is obtained by boiling the comb. This causes the wax to melt and rise to the surface of the vessel, when it can be dipped off. On cooling, it solidifies. As thus obtained, beeswax is of a dark yellow or brownish color and contains numerous impurities. These can be removed by remelting and filtering. By cutting the wax into thin sheets and exposing it to the air and sun for some days it is bleached so that it becomes a pure white. Most of the beeswax placed upon the market is bleached. It is used in small quantities by seamstresses, in the manufacture of candles, the preparation of ointments and cements and as a vehicle for colors. See BEE; WAX.

BEET, a plant cultivated chiefly for its root, which is large and juicy and varies in color from white to a deep red or almost black. There are many varieties, each with some special merit. Beet roots are cooked and used as a table vegetable and for pickles, and the young leaves are used as *greens.* In some localities, beets are a valued food for cattle. The most important use of beets, however, is in the manufacture of sugar, about three-fifths of all the sugar produced in the world coming from this source. Germany, Austria, Russia and France are the leading countries in the beet sugar industry, but the cultivation of the sugar beet is rapidly spreading in the United States. This beet closely resembles the varieties ordinarily raised in gardens, and thrives best in a cool temperate climate, having a reasonable supply of moisture. It has been successfully raised in California, Michigan and Utah, but Colorado is the leading state in its production. The annual crop is about 4,000,000 tons, while Canada raises about 148,000 tons a year. See SUGAR, subhead *Beet Sugar.*

BEETHOVEN, *ba'toh ven,* LUDWIG VON (1770–1827), a great German musical composer, whose name is forever associated with the symphony and the perfecting of that form of music. He was born at Bonn, studied under his father, a tenor singer, and at intervals received instruction from more noted teachers. In 1783 the youth began to publish his productions. He became assistant court organist in 1785, and in 1792 was sent by the elector of Cologne to Vienna, where he was the pupil of Haydn. There, in spite of many discouragements, he acquired a high reputation for pianoforte extemporization, though the merit of his written compositions was not recognized. In or near Vienna almost all his subsequent life was spent, his artistic tour in North Germany in 1796 being the most important break.

BEETHOVEN

Beethoven's later life was rendered somewhat morbid by his deafness, of which the first signs appeared in 1797. However, his best works were published after 1800, two periods being observable: the first from 1800 to 1814, which produced *Symphonies* 2 to 8, the opera *Fidelio* (originally *Leonore*), the music to Goethe's *Egmont* and his most notable overtures; the second, which saw the creation of the *Ninth Symphony* and the more important of his sonatas, notably the *Moonlight* and *Kreutzer* sonatas. His *Fifth* and *Ninth* symphonies are among the most beautiful compositions extant.

BEE'TLE, the common name of the Coleoptera, the largest order of insects, of which there are known to be at least 150,000 species. They have four wings, but the outer pair are hard and useless for flying, though they serve as a double piece of armor to cover the soft back of the insect. In some species the wing covers are beautifully colored and brilliantly marked in varied designs. These sheathlike wings gave the beetles their scientific name, for *Coleoptera* means *sheathwinged. Beetle,* which comes from the Anglo-Saxon for *biter,* refers to the mouth parts, which are fitted for biting and tearing.

There are minute, almost microscopic forms of beetles, and large ones which may reach four inches in length. There is no uniformity in shape, as some are almost globular, others flat and round; some are long and slender, others thick and broad. In some species the mandibles or jaws are very large and strong; in some, the head is extended in a long beak not a part of the mouth. Beetles are found in the water, on the land, in flowers, in the ground, in the homes of other insects and even living as parasites in other animals. No parts of the world are free from them. Even the waters of hot springs and the ocean make homes for them. Their range of food is as

BEETLES

Ladybird (3 times natural size) June Beetle (¾ natural size) Apple-Tree Borer (natural size) Stag-Beetle (½ natural size) Great Water Scavenger (½ natural size) Larva of Great Water Scavenger (½ natural size)

wide as their habitations. Many species capture their food alive, while others prefer dead and decaying tissues.

They have powerful compound eyes and sensitive antennae, or feelers, which vary wonderfully in size and shape. Some are sawlike, others feathery, others long and smooth, some bearing leaf-shaped attachments, others terminating in knobs or catkinlike enlargements. Some beetles protect themselves by their mandibles, others by imitating their surroundings very closely, while some feign death and drop to the ground when disturbed. Some inoffensive species imitate wasps and hornets in their actions and so escape attack, while still other species protect themselves by shooting offensive odors at a pursuer.

The usefulness of beetles in fertilizing flowers and in burying decaying substances, and in some instances, in serving as food and medicine, cannot be denied; yet in general they are very destructive and some are terrible pests.

They pass through a regular metamorphosis, and their larvae, which are usually rather thick and clumsy in shape, move about and are armed with strong mandibles, which they use viciously. The larvae are commonly known as grubs. Their pupa state, which they pass in rude cocoons or cases, sometimes lasts for several years. Very handsome collections of beetles can be easily made, because their hard wing-cases preserve their shapes, and no species is poisonous to handle.

BEGIN, Louis Nazaire, Cardinal (1840–), a Canadian prelate, born at Lewis, Quebec; educated at Quebec Seminary and the French Seminary at Rome. He was ordained priest on June 10, 1865, became bishop of Chicoutimi, 1888, archbishop of Quebec, 1898, and cardinal, 1914. He is the author of *The Rule of Faith, The Infallibility of the Sovereign Pontiffs* and other books on religious questions.

BEGO'NIA, a genus of juicy-stemmed herbs with fleshy, one-sided leaves of various colors, and sometimes showy flowers, usually pink or red, and often variegated. Different species readily mix and many varieties have been raised from the tuberous-rooted kinds.

BEGONIA

From the shape of their leaves they have been called *elephant's ear*. In temperate climates begonias are popular as house plants. They are grown without difficulty from leaf or stem cuttings.

BEHRING, *ba'ring*, EMIL ADOLPH (1854–1917), a German physician famed as the discoverer of the antitoxin which counteracts diphtheria. Among his other achievements was the discovery of a vaccine that renders cows immune to tuberculosis. After graduation from the University of Berlin Behring was appointed surgeon in the army, and subsequently he was professor in the University of Halle and director of the Hygienic Institute at Marburg. In 1901, when the Nobel prizes were first distributed, he received the prize for medicine.

BEIRUT, or **BEYROUT**, *ba'root*, or *ba-root'*, ASIATIC TURKEY, the chief seaport of Syria, capital of a province of the same name, sixty miles northwest of Damascus. Within recent years Beirut has shown great commercial development, and it carries on a thriving export trade in olive oil, cereals, sesame, tobacco and wood; its manufactures are silk and cotton. In ancient times Beirut was a large and important Phoenician city. The Byzantine emperor Theodosius II raised it to the rank of a city, and it again rose to importance during the Crusades. It was bombarded and taken by the British in 1840. In the fall of 1918 the city was entered by a French naval division, which took possession of it for the allies. Population, about 150,000.

BEL. See BAAL.

BELASCO, *be las'ko*, DAVID (1859–), an American playwright, producer and manager who became one of the best-known theatrical men of his time. He was born in San Francisco, and began a stage career as boy actor at the age of fifteen. Later he exhibited special talent in adapting plays, and subsequently, in New York City, established himself as one of the foremost managers and producers. Belasco is known everywhere for his skill in developing the talent of actors, and for his genius for achieving realistic effects in stage setting. Under his management the public has seen David Warfield in *The Music Master* and *The Auctioneer;* Mrs. Leslie Carter in *The Heart of Maryland* and *Zaza;* William Norris in *A Good Little Devil;* Frances Starr in *Marie-Odile;* Ina Claire in *Polly with a Past,* and other well-known actors. The plays which he has written or adapted include *The Girl I Left Behind Me, The Heart of Maryland, The Girl of the Golden West* and *The Return of Peter Grimm.*

BELEM, *ba laN'*. See PARA.

BELFAST', IRELAND, capital of the province of Ulster and the first city in Ireland in population, trade and manufactures. It is situated on Belfast Lough, at the mouth of the Lagan River, 113 miles north of Dublin, and on the boundaries of the counties of Down and Antrim. The harbor and dock accommodation is now extensive, new docks having recently been added. Belfast is the center of the Irish linen trade and has the majority of spinning mills and power-loom factories in Ireland. The iron ship-building trade is also of importance, and there are breweries, distilleries, flour mills, oil mills, foundries, print works, tan yards, chemical works and rope works. The commerce is extensive.

The chief educational institutions are the Queen's College and the theological colleges of the Presbyterians and Methodists. Belfast is comparatively a modern city, its prosperity dating from the introduction of the cotton trade in 1777. Within recent years it has been the scene of numerous riots because it is the chief center of opposition to Irish Home Rule. Population, 1911, 386,947.

BELGIUM, *bel'je um*, one of the smallest countries of Europe and until August, 1914, the most densely-populated of any on the continent. For eighty-four years it had been an independent kingdom, rising in that brief time from a condition of poverty to the position of one of the most prosperous, happy and progressive nations. Surrounded by powerful nations, among whom enmity might at any time develop, and unable to withstand a strong attack, Belgium had its independence and its neutrality guaranteed by treaties with Great Britain, France, Prussia, Austria and Russia. Each was obligated to protect it and to assume the rôle of "big brother" in any international crisis.

The first phase of Belgium's history as a neutral nation ended in August, 1914. On the evening of August 2 the German minister at Brussels handed to the Belgian government an ultimatum demanding that the German

troops be permitted to march through Belgium on their way to France. On the morning of August 3 the Belgian government returned a refusal to this demand, for as King Albert said, "Belgium is a country, not a road." Then followed, in defiance of treaty obligations, the invasion of the country and a long period of captivity. One by one the great cities of Belgium fell—Liége, Brussels, Ghent, Namur, Louvain and Antwerp—and by the latter part of October only a small strip of country in the northwest, in Flanders, was unconquered. Until the end of the war the army in this small section withstood all attempts to capture it.

From August, 1914, until the fall of 1918, nearly all of Belgium was under German military government, but the sacrifice made by the heroic country had far-reaching effects. The stubborn resistance to the German invasion in 1914 impeded the kaiser's army for two weeks, giving France time to mobilize its forces and England to send a small but efficient army to the continent. As a result Paris was saved, the allies won the Battle of the Marne and Germany, as time demonstrated, lost the war. The suffering of the Belgians during their four-years' captivity is known to all the world, but it has never been summarized more eloquently than in a letter written by Cardinal Mercier to his priests, which the German authorities vainly tried to suppress. In describing conditions in the winter of 1914–1915, the Cardinal said:

"I have gone through most of the places in my diocese which have been wasted . . . . What I have seen of the ruins and the ashes passes anything that, in spite of my most acute fears, I could ever have imagined . . . Churches, schools, charitable institutions, hospitals, convents, to a considerable number, are unfit for use or are in ruins. Whole villages have almost disappeared . . . . . God will save Belgium, my brothers, we cannot doubt it. Let us say, rather, He is saving her. . . . . Is there a single patriot who does not feel that glory has come to Belgium? Which of us would have the courage to tear out the last page of our history? Which of us can look without pride on the splendor of the glory that our murdered country has won?"

Location, Area, Population. Belgium lies between Holland (the Netherlands) on the north and France on the south. Its western border is washed by the North Sea, and its eastern adjoins Germany and the Grand Duchy of Luxemburg. (The boundaries thus described are those of 1914.) The French frontier is 384 miles in extent, the German sixty, the Holland 269, and the Luxemburg eighty. The shore line of the North Sea is forty-two miles long. Belgium has an area of 11,373 square miles, slightly smaller than that of Maryland. In 1910 the population was 7,423,784. This was an average of 653 persons to the square mile, twenty times the average density of population in the United States, and the highest of any country in Europe. In two provinces, Brabant and East Flanders, there were 1,158 and 957 persons, respectively to each square mile. As in other warring countries, the next census may show a decrease in population from the pre-war statistics.

Surface and Drainage. Belgium lies across the central European plain, forming, as does Holland, a part of the "Low Countries." The surface resembles an inclined plane. The highest lands are in the southeast, and from these the country slopes gradually to the north and northwest, where it becomes a low, flat plain. The southern and eastern portions are broken and hilly. Extending through the central part of the country from north to south is a low swell which divides the basin of the Meuse from that of the Scheldt. North and west of this the land is low and level, and along the coast a sandy beach meets a shallow sea. This portion of the country is generally unattractive, but the southern and eastern portions are noted for the beauty of their scenery.

Belgium is watered by the Meuse, flowing across the eastern, and the Scheldt, flowing across the western, part. Each of these rivers has numerous tributaries extending into all parts of the country.

Mineral Resources. The southern and eastern provinces are rich in minerals, the most important being coal and iron. Lead, manganese and zinc are mined to some extent, and quarries of limestone, slate and marble are worked. The coal fields have an area of about 550 square miles.

Agriculture. With the exception of the sandy plains in the north and some of the rocky regions among the mountains, the soil is fertile and well suited to agriculture. All tillable portions are occupied. The land is divided into small farms ranging from one and one-half to twelve and fourteen acres in size, and is intensively cultivated with pains-

taking care. Although the land has been cultivated for a thousand years it is yet the most productive in Europe. The low country in the north is generally devoted to raising live stock and to dairying. The hill farms in the southeast also raise live stock, principally horses, and in other localities large numbers of hogs are raised. The most important crops are flax, rye, oats, wheat, sugar beets, hops and tobacco.

The interests of the farmers have been carefully guarded by a government board of agriculture in each province. About one-seventh of the area of the country is covered with forests, but these are unevenly distributed, most of them being found in the hilly provinces of the southeast. Oak is the prevailing wood and it furnishes considerable valuable timber. Agriculture and forestry occupy the attention of about one-half of the people.

Manufactures. Manufacturing has been the most important industry, and the products were numerous and varied. Much of the work was done in small shops, in which the proprietor worked alone or with one or two workmen, though large factories were numerous. The location of some of the chief industries was determined by the natural resources. The large iron works were in the southern and eastern provinces, near the coal and iron ore. They manufactured cast iron and steel and machinery of all kinds. Firearms, nails, shot, tinware and zinc were also important articles of manufacture. Flanders has long been the center of the flax industry, and this province has for centuries been noted for the superior quality of its linens.

Liége, Verviers, Bruges and a number of other cities were noted for their manufactures of cotton and woolen goods. Lace is one of the most widely-known of Belgian manufactures. Much of this was made by hand and cannot be duplicated in any other country. The industry was distributed through nearly all the provinces. Belgium has also been one of the leading glass manufacturing countries of the world, and porcelain and other varieties of pottery ware of high grade were also made in some provinces. Brussels and Ghent were the centers of an important jewelry manufacture; in the agricultural district large quantities of sugar were made, and breweries and distilleries were numerous.

Transportation. The Meuse and the Scheldt are navigable, and many of their tributaries have been canalized. Besides these, there are numerous canals, so that the country has a complete system of inland waterways, extending to all the important towns. The railway system is very complete; Belgium has more miles of rail than any other country, in proportion to size. There were 2,975 miles in operation in 1914, nearly all under government control. Most of the sea-going trade is carried on through Ostend and Antwerp.

The pre-war imports consisted chiefly of food products and raw materials, such as cereals, cotton, flax, wool, lumber, minerals, chemicals and drugs; while the exports included cotton and wooden goods, laces, machinery and other manufactured products. France, Germany, Great Britain, the United States, Argentina and Russia were the leading countries connected with the foreign trade before 1914.

Inhabitants and Language. The inhabitants include two distinct types: a dark race (the Walloons) which came from the south and is undoubtedly descended from the ancient Belgae, whom Caesar called the most valiant of his foes; and the descendants of the Celts who entered the country from the north (the Flemings). Both Flemish and French are spoken, and for this reason nearly all places in the country have two geographical names, one Flemish and the other French.

Education. A system of elementary schools is maintained either by the state or the local government. The smallest unit for the maintenance of such a school is the commune. In addition to these, schools similar to our high schools are maintained by the government. Important state universities are located at Ghent and Liége, and each of these contains schools of engineering and manufactures, arts and mechanics. At Brussels and Louvain there are free universities. The beautiful buildings of the latter were burned by the Germans in 1914. There are also other industrial schools and normal schools. The Roman Catholic Church maintains a large number of parochial schools, which are estimated to equal the number of public elementary schools.

Government and Religion. The government is a constitutional monarchy, and the crown is hereditary in the direct male line of descent. The king is assisted by the

Ministers, who are heads of the various departments of state. The legislative power is vested in a national parliament, known as the Chambers, and consisting of a Senate and Chamber of Deputies. The Senate is composed of 102 members, seventy-six of whom are elected by citizens, and the remainder by provincial councils. The members of the Chamber of Deputies are elected by direct vote of the people. For the purpose of local government, the country is divided into nine provinces, each under a governor appointed by the king. Each province has its council, which is chosen by a direct vote for a period of eight years. These provinces are divided into *arrondissements*, which are again subdivided into judical arrondissements and cantons.

The king is Albert I; the crown prince is Prince Leopold (born 1901). The queen is Elizabeth.

There is no state church; all religions are tolerated and the state contributes to the support of the clergy of all denominations; but Roman Catholicism is the prevailing belief and is embraced by about nine-tenths of the people.

Cities. The most important cities are Brussels, the capital, Antwerp, the principal seaport, Liége, Ghent, Malines, Bruges, Louvain, Namur and Ostend.

History. Belgium takes its name from the country inhabited by the ancient Belgae, which extended from the mouth of the Scheldt as far south as the Seine, and from the sea to the Vosges Mountains. From the time of the Roman occupation till early in the sixteenth century this portion of Europe was claimed first by one power and then by another. During the reign of Charles V it became a part of the kingdom of Spain. In the religious war waged by Philip II, the northern part of the country, or the Netherlands, secured its independence, but Belgium was left subject to Philip. By the Treaty of Utrecht, which closed the War of Spanish Succession, Belgium was given to Austria, but it was seized by France in 1744, only to be restored to Austria by the Treaty of Aix la Chapelle. During the career of Napoleon, Belgium was closely united with France, and at the Congress of Vienna in 1815 it was united with the Netherlands under one government, but fifteen years later Belgium revolted and declared its independence. In 1831 its neutrality was guaranteed by a concert of the European powers.

Under its present constitution the country entered upon an era of prosperity. Soon after the beginning of the reign of Leopold II (1865), the king inaugurated a policy of expansion, as a result of which he was placed at the head of the International African Association and made ruler of the Congo Free State. Leopold was succeeded in 1909 by Albert I, whose happy reign was interrupted in 1914 by the outbreak of the great European war. The Belgian army, under direct command of the king, held the northwest corner of the country against all attacks. In 1914 the capital was removed to Havre, France.

Although Germany publicly announced in 1914 that Belgium would be restored after the war, the continued success of German arms changed the current of Teutonic opinion. It became clearly evident that Belgium was not to be allowed to return to its former status, if the German will should prevail. The German government stripped Belgium of the machinery of its factories and sent it to German cities, and Belgium workmen were deported by thousands. Belgian cities were given German names. The most outstanding evidence of German intention to dominate the country appeared in the open attempt to separate the two linguistic groups of Belgians, the Walloon and the Flemish elements, and to make it appear that the latter no longer desired political union with the former. These efforts failed, and in the fall of 1918 a united Belgium witnessed the departure of the invaders and the restoration of the whole country.

Belgium made certain claims at the Peace Conference. Among these were a demand for an indemnity sufficient to rebuild its industrial enterprises and the abandonment of the old status of a neutral state. The Belgian people no longer desired to be protected by a treaty that could at any time be regarded as a "scrap of paper." They asked for full independence, in the sense that it is enjoyed by Holland, France and England.

Related Articles. Consult the following titles for additional information:

GEOGRAPHY

Antwerp	Liége	Namur
Bruges	Louvain	Ostend
Brussels	Maulines	Scheldt
Ghent	Meuse	Ypres

HISTORY

Albert I	Leopold II
Congo	Netherlands, The
Flemish Language	Succession Wars
Germany	Vienna, Congress of
Great Britain	World War

BELGRADE, *bel grayd',* SERBIA, the capital and largest city of the kingdom, situated on the south bank of the Danube at its confluence with the Save. From October, 1915, until the fall of 1918, Belgrade was in the possession of the Central Powers; on the collapse of the Teutonic alliance it was restored to Serbia (see WORLD WAR). The city is strongly fortified, and at the end of the medieval period it was an outpost of Hungary, helping to keep back the Turks. After a long period of changing fortunes, during which it was alternately in the hands of the Turks and the Austrians, Belgrade became, in 1866, a Serbian city. Since that date it has developed into an up-to-date city enjoying modern lighting and transportation and possessing wide streets and fine public buildings. The notable edifices include the palace of the king, a great cathedral, the national theater and the Royal Serbian Academy of Sciences. Belgrade University, founded in 1838, had over 900 students before the World War. In normal years the city has prosperous manufactories of carpets, silks, hardware and cutlery. Population, 1910, 90,890. It decreased during the four years of war, at times to half its peace-time size. See SERBIA.

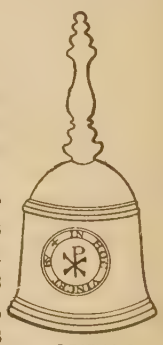
BELIAL, *be'le al or beel'yal,* a word which by the translators of the English Bible is often treated as a proper name, as in the expressions, *son of Belial, man of Belial.* In the Old Testament, however, it should be translated *wickedness* or *worthlessness.* To the later Jews, Belial seems to have become what Pluto was to the Greeks, the name of the ruler of the infernal regions; and in *II Corinthians* VI, 15, it seems to be used as the name of Satan, as the personification of all that is bad.

BELISA'RIUS, (505–565), the great general to whom the Emperor Justinian owed the military splendor of his reign. Belisarius obtained the chief command of an army on the Persian frontiers, and in 530 gained a victory over a superior Persian army. In 532 he checked the disorders in Constantinople and saved the life of Justinian. Successful wars were waged by him against the Vandals, the Goths and the Bulgarians, but in spite of all his service he was accused of treason and imprisoned. He was, however, released before his death and restored to his honors.

BELIZE, *be lees',* the capital and only trading port of British Honduras, situated at the mouth of the southern arm of the river Belize. It has no docks, for the water inside of an encircling lagoon is too shallow for navigation; steamers have to anchor a mile or more from the river mouth and land their cargoes by lighters. The exports are chiefly mahogany, rosewood, logwood, cedar, cocoanuts and sugar. Since before the year 1600 it has been exporting these products. Population, 1911, 10,478.

BELL, a hollow, somewhat cup-shaped sounding instrument, made of a kind of bronze known as *bell metal* (see BRONZE). Bells are now made by molding from a single piece of molten metal. Besides their use in churches, bells are employed for various purposes, a common one being to summon attendants or domestics in private houses, hotels and offices. Bells for these purposes are of small size and are either held in the hand and rung, or rung by means of an electric battery. The last method is now by far the more general. At sea, time is measured by the ringing of a bell every hour and half hour; the sailor, instead of saying *four o'clock,* says *eight bells. One bell* is half-past twelve in the morning; one o'clock A. M. is *two bells,* etc.

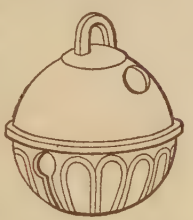
The Egyptians and Israelites used a rude form of bells, and it is known that bells of considerable size were in early use in China and Japan, and that the Greeks and Romans also employed them for various purposes. One form, used in ancient Egypt and Greece, was known as the *crotal.* Bells are said to have been first introduced into Christian churches about A. D. 400 in Campania. From the combination of the names *campania* and *nola,* which were old names for bell, was obtained the name *campanile,* which means bell tower. Bells were introduced into France in 550 and into England a little more than a century later. The oldest bells now existing in Great Britain and Ireland, such as the "bell of Saint Patrick's Will" and Saint Ninian's, were four-sided



QUEEN MARY'S HAND BELL

and made of thin iron plates hammered and riveted together.

Until the thirteenth century bells were of comparatively small size, but after the casting of the Jacqueline of Paris (6½ tons) in 1400, their weight rapidly increased. Among the more famous bells are the bell of Cologne, 11 tons, 1448; of Danzig, 6 tons, 1453; of Halberstadt, 7½, 1457; of Rouen, 16, 1501; of Breslau, 11, 1507; of Lucerne, 7½, 1636; of Oxford, 7½, 1680; of Paris, 12⅔, 1680; of Bruges, 10¼, 1680; of Vienna, 17¾, 1711; of Moscow (the monarch of bells), 193, 1736; the Liberty Bell, at Philadelphia, 1752; three other bells at Moscow, ranging from 16 to 31 tons, and a fourth, of 80 tons, cast in 1819; the bell of Lincoln, Great Tom, 5½, 1834; of York Minster, Great Peter, 10¾, 1845; of Montreal, 13½, 1847, the largest bell in America; of Westminster, Big Ben, 15½, 1856; of Saint Stephen, 13½, 1858; the Great Bell of Saint Paul's 17½, 1882.



ANCIENT BELL

BELL, Alexander Graham (1847–), a Scottish-American inventor whose greatest service to mankind was in the invention of the telephone. This honor was contested unsuccessfully by Elisha Gray (which see). He was born in Edinburgh, but at the age of twenty-three removed to Canada and in 1872 to Boston, where he became a teacher in Boston University, in the chair of vocal physiology. There he enlarged upon his father's system of teaching the dumb to speak.

ALEXANDER GRAHAM BELL

His fame and fortune are due to the invention of the telephone, which was publicly exhibited at the Centennial Exposition in Philadelphia in 1876; most people believed it then to be merely an ingenious mechanical toy. Bell was also the inventor of the graphophone, the forerunner of the present talking machine. He also devised a telephone probe for painless detection of bullets in the human body. Bell has been honored by most of the world's scientific societies.

BELL, John (1797–1869), an American statesman, born near Nashville, Tenn., and a candidate for President of the United States against Lincoln, Douglas and Breckinridge in 1860. Bell served in Congress as a Whig from 1827 to 1841, winning a reputation as a debater and especially as an ardent supporter of the protective tariff. He supported General Jackson as candidate for the presidency in 1832, and two years later was elected speaker of the House of Representatives. In 1841 Bell was appointed secretary of war by President Harrison, and he was later in the United States Senate for ten years. He opposed the Texas annexation policy, advocated Henry Clay's compromise of 1850, voted against the Kansas-Nebraska bill of 1850 and opposed the repeal of the Missouri Compromise. In 1860, when secession was threatened by the Southern states, a convention of so-called "Constitutional Union" men nominated him for president, and he received the electoral votes of Tennessee, Virginia and Kentucky. He, with other citizens of Tennessee, issued an address in favor of an armed neutrality in Tennessee in 1861, but he later supported the Southern policy.

BELL, Robert, (1841–), a Canadian geologist, born at Toronto, and educated at McGill and Edinburgh universities. Dr Bell is one of Canada's most distinguished geologists and has done much to add to knowledge of Canadian conditions. He made the first surveys of many of the western rivers and lakes, among them Lake of the Woods, Winnipeg, both lake and river, Great Slave Lake and the Athabasca, Slave, Nelson and Moose rivers. He is a member of many scientific societies and has published numerous reports and papers of value.

BELLADON'NA, the deadly nightshade, a plant that is poisonous in all its parts, but is the source of a valuable drug. This is commonly known by the name of *extract of belladonna*. It is narcotic and is of great value in the treatment of asthma, bronchitis, whooping cough, colic and various intestinal disorders. Liniment made from belladonna is also used externally to heal neuralgia. The drug has the property of causing the pupil of the eye to dilate, and is used by oculists in eye examination and treatment. The fruit of the plant is a dark, brownish-black, shining berry, which is exceedingly poisonous and unfit to eat. The word *belladonna* is the Italian for *beautiful lady*, and is said to have

been given because the juice was once used to give a brilliant appearance to the eye.

BELLADONNA LILY, so called on account of its beauty, a plant having delicate blushing flowers clustered at the top of a leafless flowering stem. It is a native of the Cape of Good Hope and of the West Indies.

BELLAIRE, *bel lair'*, O., a manufacturing city in Belmont County, on the Ohio River, four miles south of Wheeling, on the Pennsylvania, the Baltimore & Ohio, the Ohio River & Western and the Wabash railroads. The industries center principally around steel and glass. There is one park, a hospital and a Federal building, completed in 1914 at a cost of $125,000. The town was founded in 1795, was incorporated as a village in 1858 and as a city in 1874. Population, 1910, 12,946; in 1917, 14,575 (Federal estimate).

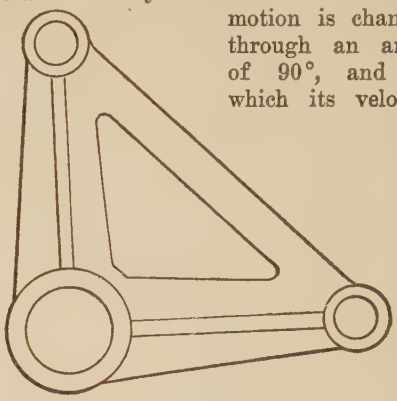
BEL'LAMY, EDWARD (1850–1898), an American lawyer and author, born in Massachusetts, remembered chiefly for his *Looking Backward,* a novel describing an idealistic condition under socialism. He was admitted to the bar in 1871, but subsequently entered journalism, being connected with the Springfield, Mass., and New York press. *Looking Backward* was published in 1888.

BELL'BIRD, the name of a South American bird, so called because of its peculiar notes, which sound like the tolling of a bell. It is glossy white in color. From the forehead at the base of its beak grows a short

BELLBIRD

cylindrical projection of black skin dotted with small bunches of feathers. When the bird utters its note this projection slowly extends to perhaps five inches in length. There was once a belief that the bird could cause this projection to stand erect when frightened, but it is not true.

BELL-CRANK, in machinery, a rectangular lever by which the direction of motion is changed through an angle of 90°, and by which its velocity



BELL-CRANK

ratio and range may be altered at pleasure by making the arms of different lengths. The bell-crank is much employed in machinery; it is so called because it is the form of crank usually employed in changing the direction of the wires of house bells.

BELLES-LETTERS, *bel let'r,* a French expression which means literally *beautiful letters,* and is generally used as the equivalent of *fine literature,* or literature that appeals to the imagination. Poetry is a typical form of belles-lettres, and the term can also be applied to much of the fiction, drama and essay literature of the world. The expression appeared first in an English work in 1710 in an issue of *The Tatler.*

BELLE ISLE, *bel'ile',* STRAIT OF, a channel separating Newfoundland and Labrador. It is about eighty miles long and twelve miles wide, and is the northern entrance from the Atlantic into the Gulf of Saint Lawrence. Steamers from Glasgow and Liverpool to Quebec, coming round the north of Ireland usually follow this channel in summer because it provides the shortest route.

An island known as Belle Isle lies at the eastern end of the strait. On its southern shore is a great lighthouse, 470 feet high. The island is fifteen square miles in area.

BELLEROPHON, *be ler'o fon,* in Greek mythology, the hero who slew the Chimaera (which see). He had been sent on this quest by the king of Lycia, who wished to be rid of him, but he was assisted by Minerva in securing Pegasus, the winged horse, and with the aid of this steed he killed the monster. Legend says that in his later years he attempted to soar on Pegasus to the abode

of the gods, and that for his presumption he was dashed to the earth and killed.

BELLE'VILLE, ILL., the county-seat of Saint Clair County, fourteen miles southeast of Saint Louis, on the Illinois Central, the Louisville & Nashville and other railroads. It is also connected with Saint Louis by electric railways. It is in an agricultural and coal mining region and has machine shops, iron foundries, a nail factory, carbon works, hosiery mills and a shirt factory. The city has a Carnegie Library, Saint Peter's Cathedral, Saint Elizabeth's Hospital and a Federal building, erected in 1913. The town was settled in 1814 and was incorporated in 1850. Population, 1910, 21,122; in 1917, 21,154 (Federal estimate).

BELLEVILLE, ONTARIO, the county town of Hastings County, on Lake Ontario, at the mouth of the Moiva River. The Bay of Quinte forms a fine harbor. It is on the Canadian Pacific, the Canadian Northern and the Grand Trunk railways, and is forty miles west of Kingston. The city is in the midst of a fertile agricultural and dairy country, and its leading industries are commerce and manufactures. The most important manufacturing establishments consist of ironworks, factories and sawmills. The provincial institute for the deaf and dumb is here, and there is also Albert College, with departments for both sexes, and Saint Agnes College, for women. Belleville was the home of Sir Mackenzie Bowell. Population, 1911, 12,620.

BELLIGERENT, *be lij'er ent.* When a nation engages in war against another nation and the state of war is recognized by other countries, each nation so engaged is called a *belligerent.* The word means *to wage war.* As soon as nations in conflict are recognized as belligerents by neutral powers they automatically place themselves under international laws governing the conduct of war; they accept the protection of such law as to their rights and also assume responsibilities imposed by international law respecting their conduct towards both enemies and neutrals. Nations which, in war, become a law unto themselves and wilfully violate international agreements in the conduct of hostilities earn the severe condemnation of other governments and peoples.

BELL'INGHAM, WASH., formed in 1903 by the union of Whatcom and Fairhaven, is the county seat of Whatcom County, ninety-eight miles north of Seattle, by rail, on the Great Northern, the Northern Pacific, the Canadian Pacific and the Bellingham & Northern railroads. The city is in a region of beautiful scenery, has four parks, and is industrially important. It claims to possess the largest salmon cannery in the world; the company operates its own ships. It is also a center for the manufacture of lumber and shingles. A Federal building was erected in 1913 at a cost of $280,000; there are two Carnegie libraries, and here also is a state normal school, with five buildings. There are two hospitals. Population, 1910, 24,298; in 1917, 34,362 (Federal estimate).

BELLINI, *bel le'ne,* GIOVANNI (about 1426–1516), the founder of the Venetian school of painting. His father who excelled in portraits, and his older brother, Gentile, both painted with him and were worthy representatives of the school. Giovanni contributed much to make oil painting popular and has left many noteworthy pictures. He was a colorist of the first order and did much to impart the marvelous golden tone to Venetian painting. Titian and Giorgione were among his pupils. Among his best known works are *Peter Martyr, The Crucifixion, The Coronation of the Virgin* and *The Transfiguration.*

BELLINI, VINCENZO (1802–1835), a celebrated composer, born at Catania, Sicily. He was educated at Naples and commenced writing operas before he was twenty, composing for the principal musical patrons of Europe. His most celebrated works are *Il Pirata* (1829); *La Somnambula* (1831), *Norma* (1832), his best and most popular opera, and *I Puritani* (1834). His untimely death, at the age of thirty-three, cut short a career which promised much for musical art.

BELLO'NA, the goddess of war among the Romans, often confounded with Minerva. She was the sister of Mars, or, according to some, his daughter or his wife.

BELLOWS, *bel'lus,* a machine for producing and directing a strong current of air. The bellows is used to increase the heat of a fire by causing it to burn more rapidly. The common blacksmith bellows has three boards, the upper, lower and center. These are connected by flexible leather sides, which are air-tight. A weight is attached to the lower board. When it falls, air is drawn in through a valve. A lever is also attached to the board

by which it is raised. When the lower board is raised the air in the lower chamber is forced through a valve in the center board

BELLOWS

into the upper chamber. A weight upon the upper board forces the air out through the nozzle, which is connected with the forge. Such a bellows produces a continuous current of considerable force. See BLOWING MACHINE.

BELLOWS FISH, also called the *trumpetfish*, or *sea-snipe*, a fish not uncommon in the Mediterranean and on the west coasts of Europe. It is from four to five inches long and has an oblong oval body and a tubular elongated snout, which is adapted for drawing from among seaweed and mud the minute animals on which it feeds.

BELL-SMITH, FREDERICK MARLETT (1846–), a Canadian artist, was born in London, England, and studied drawing at South Kensington. He arrived in Canada in 1867 and became a charter member of the Society of Canadian Artists, organized in that year. He is a member of the council of the Royal Canadian Academy of Arts, president of the Ontario Society of Artists and has been director of fine arts in Alma College since 1881. Among his principal paintings are *Queen Victoria's Tribute to Canada*, for which Her Majesty gave personal sittings, *Landing of the Blenheim*, in the national collection at Ottawa, and *Lights of a City*, in the Ontario collection.

BEL'MONT, AUGUST (1816–1890), an American financier, born in Germany. He was employed by the Rothschilds in various capacities and represented them at New York after 1837. He was Austria's consul general at New York from 1844 to 1850 and in 1854 became American minister to Holland. He took an active interest in politics, being chairman of the national Democratic committee for twelve years, and he was also a liberal patron of the fine arts.

August Belmont, son of the above (1853–1919), also became a prominent capitalist, and was an officer and director in many large railway, banking and manufacturing corporations, including the consolidated traction lines of New York City. He was president of August Belmont & Company, and the American representative of the European banking houses of the Rothschilds. In 1910 he married Eleanor Robson, the actress. Belmont was for years prominent in Democratic politics.

BELOIT, *be loit'*, WIS., a city in Rock County, close to the Illinois state line, ninety miles northwest of Chicago, on the Chicago, Milwaukee & Saint Paul and the Chicago & Northwestern railroads. The river furnishes water power and the city contains foundries, paper mills and extensive manufactories of gas engines, windmills, scales and other articles. The city is the seat of Beloit College, a small Congregational institution of high standing. Beloit was settled in 1824. Population in 1910, 15,125; in 1917, 18,547 (Federal estimate).

BELSHAZZAR, *bel shaz'ar*, the last of the Babylonian kings, who figures in the story of the "hand upon the wall" (see BIBLE, subhead *Bible Stories*). He died in 538 B. C., during the successful storming of Babylon by Cyrus, as recorded in the book of *Daniel*. The following stanza is taken from a well-known hymn describing the episode of the miraculous writing:

At the feast of Belshazzar and a thousand of his lords,
As they drank from golden vessels, as the Book of Truth records,
In the night, as they reveled in the royal palace hall,
They were seized with consternation—
'Twas the hand upon the wall.

BELT, or **BELTING**, a flexible endless band, or its material, used to transmit motion or power from one wheel, roller or pulley to another. Driving belts are usually made of leather, india rubber or woven material, but ropes and chains are also used for the same purpose.

There are a number of ways of lacing a belt, but every machinist has his own favorite method. One rather complex but effective way is to punch twenty-four holes, thirteen on one side and eleven on the other side. The lace is doubled in the center of its length and run through the middle hole of the second row on that side of the joint which contains eleven holes. The lace is passed over and under from side to side, bringing both ends of the lace out of the middle hole, and there the ends are tied on the outside of

BENEDICT XV

Giacomo della Chiesa, born November 21, 1854, at Pegli, Italy. Ordained priest, 1878; made bishop of Bologna, 1907; created Cardinal, May, 1914; elected Pope, September 3, 1914.

the belt. By this means there is no crossing of the lace on either side. There can be no side play, and the lace will not creep.

When a light belt is called upon to do little work, it is customary to lace the belt shoestring fashion, back and forth through single rows of holes, always beginning the lacing in the center of the belt. Imperfectly adjusted belting is a fruitful cause of power waste, and a poorly laced joint is the principal cause of loss of transmitted energy. If a lace be crossed on the under side the belt is raised from the pulley every time the joint comes around, and not only is the power wasted, but the lace is soon worn through. Sometimes the lace on the other side is covered by a piece of belting, scraped thin and cemented to the joint. In many cases the ends of the belt are scarfed, the laps cemented together and the whole strengthened by rivets.

BELT, The Great and The Little, the names of two straits of eastern Denmark, which connect the Baltic Sea with the Cattegat. The Great Belt runs between the islands of Zealand and Funen and is, on an average, about fifteen miles wide, but its greatest breadth is twenty miles. The navigation of this strait is exceedingly dangerous, because of the numerous small islands and sand banks in the channel. The Little Belt runs between Funen and the coast of Jutland. In the narrowest place this strait is about a mile wide. A strong current often flows through both of these channels.

BELUCHISTAN, *be loo che stahn'.* See Baluchistan.

BELU'GA, a kind of whale or dolphin, the white whale or white fish found in the northern seas of both hemispheres. It is from twelve to eighteen feet in length, and is pursued for its oil, classed as *porpoise oil,* and for its skin. In swimming, the animal bends its tail under its body like a lobster and thrusts itself along with the rapidity of an arrow. A variety of sturgeon found in the Caspian and Black Seas is also called beluga.

BENARES, *ben ah'rez,* the most sacred city in the world to the Hindus and the headquarters of their religion. It extends for several miles along the banks of the holy Ganges River, and is 390 miles northwest of Calcutta. From the river bank long stairs lead to many Hindu temples and mosques, of which the city has more than 1,500. These are visited annually by unnumbered thousands of pilgrims, who believe that if they die there they gain instant admission into paradise. Benares carries on a large trade in the produce of the district, and manufactures silk shawls, embroidered cloth and jewelry. Population, 1911, 203,804.

BENEDICT XV (1854–), Giocomo della Chiesa, the successor of Pius X as Pope. It was his fate to be elected to the Papal office shortly after the outbreak of the greatest war in history, and because of the complex international situation created by the struggle he had some of the most difficult problems to meet that have ever faced any Pope. Pope Benedict maintained an impartial neutrality throughout the conflict, and in 1917 made an unsuccessful effort to bring about peace by addressing an appeal to all the belligerents. His Holiness was born at Pegli, Italy, on November 21, 1854, was ordained priest in 1878, and in 1887 became secretary to Cardinal Rampolla, then the Papal secretary of state. In 1907 he became one of the Advisers to the Holy Office, and later in the same year was appointed Bishop of Bologna. On May 30, 1914, he was created cardinal, and a few months later, on September 3, was chosen Pope in a conclave which lasted only four days. This was the shortest conclave in the history of Papacy, and no other Pope has been chosen after so short a service in the office of cardinal.

Pope Benedict came to his high office after a brief but thorough training. While secretary to Cardinal Rampolla he was intimately connected with the negotiations between the Papacy and the European powers, thus acquiring a knowledge of facts and diplomatic methods which stood him in good stead in the delicate situations caused by the World War. Similarly, the Pope's administration of the see of Bologna, one of the most important in Italy, proved invaluable experience for the administration of the greater office which he was later called upon to fill. A man of aristocratic birth and training, a noted scholar, famous for his fearlessness and moral courage, Pope Benedict is certain to occupy a prominent place in the history of his time.

No other Pope entered upon his exalted duties at a time of greater world stress. The World War made his position exceedingly delicate. His good offices were at various times employed in the direction of peace, but without result.

BENEDICTINE, *ben e dik'tin*, a strong liquor originally prepared by the Benedictine monks of the abbey of Fécamp, in Normandy, France. It is now manufactured by a secular company, and the process is a trade secret. While it is said to have medicinal properties, it is chiefly in use as a cordial after dinners.

BENEDICTINES, an order of monks noted for their following of the rules of Saint Benedict. The first monastery of the Order was established at Monte Cassino by Saint Benedict, about 529. Benedict's idea was that each monastery should be a separate organization, and that the monastery should, for the monk, take the place of the family. The Order spread very rapidly, and after the sixth century the Benedictines were the leaders in the spread of Christianity and civilization in the West. During the Dark Ages the order was very influential in preserving some of the traditions which the bishops had been instrumental in keeping alive, and their monasteries were the only places where the followers of the Church could find meeting-places in which they would be separate from the social classes.

These monasteries became very large establishments, and their membership embraced not only monks but laymen. Within them various industries and trades were prosecuted, and some of the brothers were noted for their skill in dyeing, weaving of cloth and tanning. It was also in these monasteries that many of the books written before the invention of the art of printing were made. The Order has never lost its influence and has spread wherever the Roman Catholic Church is known.

BENEFIT ASSOCIATIONS. See FRATERNAL SOCIETIES.

BEN'EFIT OF CLER'GY, a privilege formerly recognized in England, by which the clergy accused of capital offenses were exempted from the jurisdiction of lay tribunals and were left to be dealt with by their bishop. Though originally it was intended to apply only to the clergy or clerks, later every one who could read was considered to be a clerk. A layman could only receive the benefit of clergy once, however, and he was not allowed to go without being branded on the thumb, a punishment which later was commuted to whipping, imprisonment or transportation. The benefit of clergy was abolished in 1827.

BENGAL, *ben gawl'*, one of the three great governing units, or presidencies, of British India, whose chief administrator is appointed by the Crown, with the title of lieutenant-governor. The twelve other provinces are each ruled by a governor or lieutenant-governor who is appointed by the Governor-General, or Viceroy, of India. The northern part of the Bay of Bengal is the eastern boundary of Bengal; Calcutta is the great city of the province. The area is 151,543 square miles; the greatest length is 475 miles; the greatest width, 350 miles. Into this area are crowded 57,200,000 people.

Bengal is a great plain, surrounded by mountains and crossed by many rivers, of which the Brahmaputra and the Ganges are the most important. The portion of the country around the Bay of Bengal is low and flat, and a large area of it is inundated during the rainy season each year. The soil is very fertile and supports a luxurious vegetation. It is a rich agricultural country and about 86,000 square miles are under cultivation. Of these, three-fourths are given to rice, about one-fifth to other cereals and the remainder to oil seeds, opium, indigo and a few other minor crops. Silk is manufactured, and the raising of jute is an important industry.

The manufacturing interests have suffered somewhat from the introduction of machine-made goods from Great Britain and other European countries, so that the delicate cotton and silk fabrics, formerly so common in Bengal, have nearly disappeared. Modern methods of manufacture have been introduced and large factories have been erected in some of the cities and are supported by European capital. The commerce is very extensive, and most of it is carried on through the port of Calcutta. The imports are textiles, cotton, yarn, metal, sugar and machinery; and the exports, rice, opium, indigo, wheat and cotton. Most of the trade is carried on with Great Britain, China and Japan, and to some extent with the United States and, before the World War, with Germany.

The climate is very hot and during the rainy season is unhealthful for white people, who go to the foothills of the Himalayas during the hottest weather.

The lieutenant-governor is the chief executive; he is nominally assisted by a council of fifty-two members, including twenty Hindus and seven Mohammedans. Calcutta is the capital of the presidency. The language spoken is called Bengali by the English (see BENGALI). See INDIA.

BENGAL, BAY OF, a great triangular body of water, the northern portion of the Indian Ocean, lying between India and Farther India, or Burma, Siam and Malacca and which may be regarded as extending south to Ceylon and Sumatra. It receives the Ganges, Brahmaputra and Irrawaddy rivers. Calcutta, Rangoon and Madras are the most important cities on or near its coasts.

BENGALI, *ben'gah'le,* one of the vernacular languages of India, spoken by about 50,000,000 people in Bengal. It is akin to Sanskrit, is written in characters that are evidently modified from that language, and it possesses many words borrowed from the Sanskrit. Large numbers of Bengali books and newspapers are now published. The word Bengali is English; the native term is *Banga Bhasa.* It is the native tongue of Rabindranath Tagore, who received a Nobel Prize in Literature.

BENGOUGH, *ben goff,* JOHN WILSON (1851–), a Canadian caricaturist, lecturer and poet, born in Toronto and educated at the Whitby district and grammar schools. He prepared for the practice of law, but changed to journalism. He established in Toronto in 1873 *The Grip,* a humorous weekly illustrated by himself. His political cartoons in this paper showed a high degree of artistic talent and attracted wide attention, the New York *Herald* pronouncing him the greatest cartoonist of the continent. In 1892 he severed his connection with *The Grip* and was employed for a time as caricaturist by the Montreal *Star;* later he joined the staff of the Toronto *Globe* in the same capacity. Mr. Bengough is also widely known as a humorous lecturer and as a poet. He is the author of the famous election song, *Ontario, Ontario.* Among his publications are *Popular Readings, Original and Selected; Caricature History of Canadian Politics; Motley Verses, Grave and Gay; The Up-to-date Primer, A First Book of Lessons for Little Political Economists.* He was appointed an associate of the Royal Canadian Academy of Arts upon the formation of that institution in 1880; in 1891 he was elected president of the Single Tax Association.

BENGUELA, *ben ga'la,* a district which is a part of Portuguese West Africa, situated on the west coast, and forming one of the three provinces of Angola. It has an area of about 150,000 square miles. The region is well watered and produces abundant crops. The minerals include copper, silver, salt, sulphur and petroleum, but none of them is mined to any extent. In the earlier times it was a prominent market for slaves. The only town of importance is Benguela, the capital, situated on a bay of the Atlantic in a beautiful valley. From it a railroad extends about 200 miles into the interior. It will eventually connect with the Cape-to-Cairo Railway.

BEN-HUR, a popular novel by General Lew Wallace, first published in 1880. Fully 1,000,000 copies of this story have been sold, and the dramatic version was for years a stage favorite throughout the United States. The story has a Christian-Jewish background and is laid in the time of Christ. Ben-Hur, the hero, is a young Jew who endures persecution at the hands of Messala. In an exciting chariot race—the great spectacular feature of both the novel and the play—Ben-Hur defeats his enemy and avenges himself triumphantly. Later he became a Christian.

BENJAMIN, the youngest of the twelve sons of Jacob, and founder of the tribe of Benjamites. Benjamin's mother was Rachel, and she was also the mother of Joseph. The story of these brothers is related in these volumes in the subhead *Bible Stories,* in the article BIBLE. In later history the Benjamites took part in a war against the other tribes of Israel, and at the division of the kingdom united with Judah.

BEN'JAMIN, JUDAH PHILIP (1811–1884), an American lawyer and statesman, born in the West Indies. When a young child he was taken to North Carolina; he later studied law in New Orleans and was elected United States Senator for Louisiana in 1857. He was an able and earnest advocate of the Southern cause in the pre-Civil War era, and when the Confederacy was organized, he became Attorney-General in its Cabinet, later becoming Secretary of State. He proved remarkably capable, being widely known as "the brains of the Confederacy." In 1865 he went to London, where he practiced law until his death.

BEN LO'MOND, a mountain in Scotland, in Stirlingshire, rising to a height of 3,192 feet and giving a magnificent prospect of the vale of Stirling, the Lothians, the Clyde, Ayrshire, Isle of Man and the hills of Antrim. This mountain and the surrounding country occupy a prominent place in Scott's *Lady of the Lake.*

BENNETT, the family name of two men, father and son, who won honors for American journalism.

James Gordon Bennett (1795–1872) was the founder and editor of the New York *Herald*. He was born in Scotland and was educated for the Catholic priesthood in a seminary at Aberdeen, but the reading of Franklin's *Autobiography* led him to emigrate to America in the spring of 1819. He spent a short time at Halifax, then went to Boston, where, after severe trials, he obtained employment in a printing office. In 1822 he went to New York. There he did subordinate work for various journals until in 1825 he made his first attempt to establish a journal of his own; the next ten years were occupied in a variety of similar attempts, all of which proved futile. During that period, however, he became Washington correspondent of the *Inquirer*, and his letters, written in imitation of the letters of Horace Walpole, attracted attention.

Finally, in 1835, appeared the first number of a small one-cent paper, bearing the title of New York *Herald*. This was issued from a cellar, and its proprietor and editor played also the part of salesman. Through Bennett's immense industry and sagacity, the paper became a great commercial success. He was the first to employ European and financial correspondents, and he also was the first to introduce systematic sale by newsboys. Bennett continued to edit the *Herald* till his death. The successful mission of Stanley to Central Africa in search of Doctor Livingstone was undertaken by his desire, though carried out under his son's direction.

James Gordon Bennett, Jr. (1841–1918), carried on the work of his father, but as he preferred to live in Paris, he directed the affairs of the paper by cable. He died in the French capital during a critical period of the World War, and was buried there. The younger Bennett was a man of varied interests. He served in the navy during the Civil War, and was an enthusiast on nautical affairs. He introduced polo into the United States, and was widely known in yachting and coaching circles. His interest in Arctic exploration led him, in 1882, to finance the expedition of the *Jeannette*, and years later his paper published the story of Dr. Cook, who claimed to be the discoverer of the North Pole. Bennett was one of the founders of the Commercial Cable Company. He seldom visited the United States.

BENNETT, [ENOCH] ARNOLD (1867–), an English novelist who excels in depicting the commonplace experiences of everyday life. His characters are the ordinary people one sees every day, but he has the gift for describing those characters and their routine existence in an absorbingly interesting manner. In vivid realism and insight into human nature he has no superior among contemporary novelists. Bennett was born at Hanley-in-the-Potteries, one of five towns that have furnished local color for some of his best novels. He was educated at the University of London, and since 1900 has devoted himself entirely to literature. He has visited the United States, where his books are widely read.

This author is an industrious worker. Of his numerous novels, the finest are *The Old Wives' Tale* and *Clayhanger*, both tales of the Five Towns. The latter is one of a trilogy, the other two being *Hilda Lessways* and *These Twain*. To the Five Towns series belong also *The Matador of the Five Towns* and *Anna of the Five Towns*. *Helen with the High Hand* is one of his funniest stories, and *Buried Alive* one of the most entertaining. The latter has been dramatized as *The Great Adventure*. Other works include *How to Live on Twenty-four Hours a Day*, *Milestones* (a play), *Whom God Hath Joined* and *Your United States*. In 1916 he published a novel entitled *The Lion's Share*, and in 1918, *The Pretty Lady* and *The Roll-Call*, both of them war stories.

BEN NEVIS, the highest mountain of Great Britain, situated in Scotland, on Loch Eil, at the southern entrance of the Caledonian Canal. Its altitude is 4,406 feet, and in clear weather one can look from the summit nearly across the north of Scotland from sea to sea. The Scottish meteorological society has an observatory on the mountain.

BENNINGTON, VT., county seat of Bennington County, situated in the midst of some of the finest New England mountain scenery, is four miles from the New York state line and thirty-seven miles east of the Hudson River. A battle monument 301 feet high commemorates the Battle of Bennington, a famous Revolutionary engagement. The town manufactures knit underwear, woolen goods, needles, collars and cuffs. A Federal building was erected in 1914 at a

cost of $85,000. The place was founded in 1761. Population, 1910, 8,698; in 1917, 9,181 (Federal estimate).

Battle of Bennington, a battle of the Revolutionary War, fought near Bennington, Vt., Aug. 16, 1777, between a body of Hessians from Burgoyne's invading force, and about 2,000 New Hampshire militia under John Stark. The whole British force was either killed, wounded or captured. Reënforcements from the British camp were met by Green Mountain Boys under Seth Warner and suffered a loss of more than 200 killed and 700 wounded. These two battles cost Burgoyne nearly one-seventh of his force and caused many loyalists and Indians to desert. A memorial monument was dedicated on the scene of the battle in August, 1891.

BENTON, THOMAS HART (1782–1858), one of America's greatest statesmen of the period preceding the Civil War. He was born in North Carolina, but achieved fame as a Missourian, for he moved to Saint Louis in 1815, to practice law, after serving in the War of 1812 as colonel. In that city he also edited a pro-slavery paper. He advocated the admission of Missouri as a slave state, and when it was admitted to the Union in 1820 he was chosen to the United States Senate, where he served for thirty years. He was closely connected with every important measure of his time and was especially loyal to Western interests, being an earnest advocate of the opening of mineral lands to settlement and of the construction of a transcontinental railroad. He took an active part in the discussions in regard to the Oregon boundary and the annexation of Texas, and he was in favor of the Mexican War. Because he advocated a system of coinage based on both gold and silver he was nicknamed "Old Bullion." Benton opposed Henry Clay's compromise measures in 1850, and this cost him his seat in the Senate. In 1852 he was elected to the House of Representatives, where he opposed the policy of President Pierce and the Kansas-Nebraska bill. In 1854 he was defeated for Congress by a coalition of his political opponents. He then retired from public life and devoted himself to completing his *Thirty Years' View, or a History of the Working of the American Government from* 1820 *to* 1850.

THOMAS HART BENTON

BENTON HARBOR, MICH., a city in Berrien County, on the Pere Marquette, Big Four and Michigan Central railroads. It is on the east side of Saint Joseph River and on the Benton Harbor ship canal, one and one-half miles from Lake Michigan and sixty miles northeast of Chicago. Regular lines of steamers connect it with Chicago and Milwaukee. It has a large trade in grain and lumber, is a great fruit-shipping port and has large fruit-packing, pickle and canning factories. Population in 1910, 9,185; in 1917, 11,099 (Federal estimate).

BEN'ZENE, or **BEN'ZOL,** a colorless liquid having a pleasant odor and obtained in large quantities from the distillation of coal tar. When cooled to freezing point, it solidifies, forming crystals. It burns with a smoky flame and in liquid form dissolves india rubber, iodine, gutta-percha, fat and wax. When mixed with nitric acid, benzene forms nitrobenzene, from which aniline is obtained. Benzene is very inflammable, and its vapor when mixed with air is highly explosive.

BENZINE, *ben'zin,* or *ben zeen',* a light, colorless liquid extensively used for cleaning type and printing-press rollers, for removing grease spots from clothing, as a solvent for gums, fats and resin, and in the manufacture of varnish. It is obtained in refining crude petroleum. Benzine smells and looks like kerosene, is highly inflammable, and rapidly evaporates when exposed to air. Benzine is a dangerous substance when near a flame or even a hot stove. It must not be confused with *benzene* (see above), a substance obtained in the distillation of coal tar.

BENZOATE, *ben'zo ate,* OF SODA, a compound of soda and benzoic acid which has proved to be a valuable preservative. Food substances that might decay on exposure to air can be kept sweet by means of this compound, but it can be used only in limited quantities without making the food harmful to eat. The United States government permits the use of benzoate of soda in quantities not exceeding one-tenth of one per cent. However, the best food distributors are discontinuing its use, for there is a widespread prejudice against it.

BEOWULF, *ba'o woolf,* an Anglo-Saxon epic poem, the only existing manuscript of which belongs to the tenth century and is in the British Museum. The poem is the longest and most important in Anglo-Saxon literature. It recounts the adventures of the hero Beowulf, especially his delivery of the Danish kingdom from the monster Grendel and his equally formidable mother, the slaughter of a fiery dragon and his own death from wounds received in the conflict. The character of the hero is attractive through his noble simplicity and disregard of self.

BERBER, *bur'bur,* a people spread over nearly the whole of Northern Africa, from whom the name Barbary is derived. Generally they are of about middle height; their complexion is brown and sometimes almost black, and they have brown and glossy hair. They are sparely built, but robust and graceful. They till the soil, raise herds of sheep, goats and camels, and live in tents or houses of stone or brick, as the country compels. Several distinct groups are recognized. They are known as Tauregs in the desert, Shilluhs in Morocco, Kabyles in Algeria; in their own speech all of them are called Amazirgs.

BERESFORD, *ber'es ferd,* Lord Charles William de la Poer (1846–), a British naval officer who gave the best years of his life to the development of his country's navy. He entered the service in 1868, and rose steadily, commanding H. M. S. *Condor* at the bombardment of Alexandria in 1882. Subsequently he served on Lord Wolseley's staff in the Nile Expedition (1884–1885), and from 1886 to 1888 was a Lord Commissioner of the Admiralty. In 1902 he entered Parliament, and while a member of that body devoted himself to bringing about a reorganization of the naval program. From 1905 to 1907 he commanded the Mediterranean Fleet, and from 1907 to 1909 the Channel Fleet, having attained, in 1906, the rank of admiral. In 1911 he retired from active service, but from 1910 to 1916 sat in Parliament as a member from Portsmouth.

BERGAMOT, *bur'ga mot,* an evergreen fruit tree, variously classed with the orange or the lime or as a distinct species. It is probably of Eastern origin, though it is now grown in Southern Europe. The fruit is pear-shaped, of a pale yellow color, and has a fragrant and slightly acid pulp. Its essential oil is in high esteem as a perfume. *Bergamot* is also a name given to a number of different pears, and, in the United States, to several pleasingly fragrant plants of the mint family.

BER'GEN, Norway, one of the country's chief seaports, lies north of the 60th parallel, yet has a relatively-mild climate. Except on the mountainous northeast side it is surrounded by water, and has a fine harbor. Cod fishing is so important that Bergen is the chief fishing port in Norway. One-third of Norway's shipping is owned here. The other industries, such as barrel making, are connected with the fisheries. The town was founded about 1070. England's first foreign treaty was made with Bergen in 1217. Population, 1910, 76,867; in 1919, about 80,000.

BERGH, *burg,* Henry. See Cruelty to Animals, Society for the Prevention of.

BERG'SON, Henri Louis (1859–), a French philosopher of Jewish ancestry who influenced profoundly the trend of thought of the twentieth century. He was born and educated in Paris, where he later received numerous honors. In 1900 he was appointed professor of philosophy at the College of France, in 1901 he was elected to the Institute, and in 1914 to the French Academy. In 1913 he visited the United States, lecturing at Columbia University, where he received the degree of Litt. D.

The foundation of his philosophy is that intuition rather than intellect is the key to knowledge; all former philosophies, he says, have relied too much upon intellect, which he considers an untrustworthy guide. His discussion of time has caused considerable comment. Time, he says, is the great reality, but time is not what people ordinarily think it is. We cannot mark it off as yesterday, to-day and to-morrow, for the past is no longer here, the present eludes us almost before we can recognize it, and the future is a matter of conjecture. The interesting theories of this philosopher have brought out innumerable comments and discussions, among the best of which are Horace J. Bridges' *The Religion of Experience* and Lucius H. Miller's *Bergson and Religion.* Important among Bergson's own writings are *Time and Free Will, Laughter* and *Matter and Memory.* In 1915 he made a notable address before the French Academy of Science and Morals, on *The Meaning of the War.* The World War (1914–1919) he considered a contest between life and matter, Germany typifying matter.

BERING, a name associated with the geography and history of upper North America, due to an ambitious Dutch navigator, Vitus Bering.

Vitus Bering (1680–1741) first came into prominence as a captain in Peter the Great's navy during the Swedish wars. His ability led to a command in a voyage of discovery in the neighborhood of Kamchatka. In 1728, and subsequently, he examined the coasts of Kamchatka, Okhotsk and the north of Siberia, ascertaining the relation between the northeastern Asiatic and northwestern American coasts. Returning from America in 1741, he was wrecked upon the desert island which bears his name (see below), and died there. The sea west of Alaska was named for him.

Bering Island, the most westerly island of the Aleutian chain, off the east coast of Kamchatka. It is uninhabited and contains no timber.

Bering Sea, that portion of the North Pacific Ocean extending from the Aleutian Islands to Bering Strait and bounded on the west by the peninsula of Kamchatka. During the winter it contains floating and pack ice, and most of the year its waters are covered with a dense fog. There is little navigation.

Bering Sea Controversy, a dispute between Great Britain and the United States over the seal fisheries in the North Pacific Ocean. Since 1867, the United States had carefully regulated by license the killing of seals on the Pribilof Islands, receiving a royalty for each skin; but after 1886 unlicensed fleets were organized to kill the seals during the winter months, when they are more than three miles from shore, or beyond the jurisdiction of the United States government. In order to restrict the unlicensed killing, the United States set up a claim that Bering Sea was a closed sea, that is, subject to the exclusive jurisdiction of the United States. This was protested by Great Britain, and by a treaty in 1892 the question was referred to arbitration. The tribunal, which consisted of one Englishman, one Canadian, two Americans (Justice John M. Harlan and Senator J. T. Morgan) and one representative each of France, Italy and Sweden and Norway, reported Aug. 15, 1893, a decision which was generally unfavorable to the United States. It led, however, to the adoption of other restrictions. These proved ineffectual, and negotiations were opened again in 1897. America offered to conserve the seals by prohibiting killing for one year, but Canada demanded payment for losses to its ship owners who would lose thereby, and Britain upheld the demand. The United States then passed a law prohibiting importation of sealskins unless the animals were taken from Pribilof Islands. Finally, a commission awarded damages to the Canadians, amounting to nearly $500,000. In 1899 another effort was made to reach an agreement between the two nations, but no result was reached. Meanwhile, the United States, in 1910, prohibited seal hunting for a period of five years. Control was absolute around the Pribilof Islands (which see), but the law was difficult to enforce in the open sea. See Fur Seal.

Bering Strait, the narrow channel separating Asia from North America and connecting the North Pacific with the Arctic Ocean. Its width at the narrowest point between Cape Prince of Wales and East Cape is about thirty-six miles. In depth it varies from 175 to 180 feet. During the winter it is frozen, and it is seldom free from fog or haze. It was discovered by Vitus Bering, but was first fully explored by Captain Cook in 1778.

BERKELEY, *burk'ly*, Cal., a city in Alameda County, adjoining Oakland, on the Southern Pacific and Santa Fe railroads. It has a beautiful location on the heights overlooking San Francisco Bay. The University of California, the state agricultural college, the Berkeley Bible Seminary and several preparatory schools are located here, besides institutions for the deaf, dumb and blind. There is here a great fruit company, large ink and oil works and a large carbonic company. The commission form of government was adopted in 1909. In 1905 a Federal building costing $180,000 was erected. Population, 1910, 40,434; in 1917, 60,427 (Federal estimate).

BERKELEY, Sir William (1610–1677), a colonial governor of Virginia. When Cromwell gained control of the British government, Governor Berkeley offered an asylum in Virginia to loyalists and kept the colony loyal to the king until 1651. In that year he was compelled to resign, but he was again chosen governor in 1660. His subsequent management of affairs brought him only criticism. He showed himself faithless

and obstinate in protecting the people against the Indians, and his severity by punishing the leaders in Bacon's Rebellion (which see) was the occasion of a petulant remark by King Charles II: "The old fool has taken more lives in that naked country than I did for the murder of my father." In 1677 the disappointed governor was recalled to England, where he died the same year.

BERKSHIRE, HILLS, *burk'sheer,* the name applied to the hilly region in Berkshire County, Mass. The mountains are a continuation of the Green Mountains of Vermont and reach a height of over 3,500 feet, in Mount Greylock. The beautiful scenery of this region renders it famous as a summer resort. The slopes are covered with picturesque woods, and numerous mountain streams wind in and out among the hills and valleys.

BERLIN, CONGRESS OF, an important conference of the European powers, held at the close of the Russo-Turkish War of 1878. Russia, which had been victorious in the war, obtained a highly favorable treaty from Turkey. The other European powers, however, were far from satisfied with it, as it gave too much power to Russia in Southeastern Europe. Accordingly, a congress of representatives from Germany, Austria, France, England, Italy, Russia and Turkey met at Berlin in June, 1878, to modify the terms of peace. The foremost statesmen of Europe were present, among them Beaconsfield and Salisbury from England, Prince Gortchakoff and Count Shuvaloff from Russia, Bismarck and General Von Bülow from Germany, Andrassy from Austria-Hungary, M. Waddington from France and Count Corti from Italy.

By the Treaty of Berlin, Russia was robbed of much that had been gained. By the Treaty of San Stefano, Bulgaria and Eastern Rumelia had been created an independent state, but the Congress of Berlin made of the northern part of Bulgaria proper an autonomous state, and of the southern, Eastern Rumelia, a province under Turkish dominion. (Later these sections became united Bulgaria.) Serbia, Montenegro and Rumania were allowed to remain independent, but Austria was given administrative control of Bosnia and Herzegovina, and in 1908 they were annexed to Austria-Hungary.

The principle emphasized by the Congress was that the Turkish Empire in Europe was not to be dismembered, and that questions concerning it were to be settled, not by any one power, but by all the powers in conference. In reality the Congress sowed seeds of discord which bore disastrous fruit in the Balkan Wars of 1912–1913 and the World War of 1914. The powers at the close of the latter struggle were agreed that Turkey must be dismembered for the welfare of the world.

The Brandenburg Gate

BERLIN, *ber lin',* GERMANY, the capital of the German Empire from 1871 to 1918, and a center of world-wide interest throughout the period of the World War. During that struggle of the nations the name Berlin came to stand for Germany itself — with its ruthlessness in warfare, its ceaseless propaganda, its iron discipline. This great city was also the capital of the kingdom of Prussia, the largest and most powerful of the German states, and the state most closely identified with the militarism that wrecked the empire. One of the finest capital cities in the world, well governed and prosperous, Berlin figured tremendously in the world's history during the first two decades of the twentieth century. What part it will play as the leading city of a liberal republic only time can tell.

Location and Population. Berlin is located in the heart of Germany, 180 miles southeast of Hamburg and eighty-four miles southwest of Stettin; it is less than 800 miles from each of three other great capitals, Vienna, Paris and London. The unimportant River Spree flows sluggishly through it, but by means of canals, connecting with the Elbe and the Oder rivers, the city has communication with the ports of Stettin and Hamburg. Berlin proper, with an area of about twenty-five square miles, and a population of 2,082,400 (census of 1912), is the second largest city on the continent of Europe, being surpassed only by Paris. Among the cities of the world it ranks fifth, following London, New York, Paris and Chicago. Including its suburbs, however, Berlin is exceeded only by London and New York. Greater Berlin,

with an area of 1,376 square miles, had 3,974,300 inhabitants in 1910.

Streets and Buildings. The city's most famous avenue, known throughout the world, is Unter den Linden, so named because of its great double row of linden trees. It begins at the Brandenburg Gate, the only one remaining of the gates after the city's walls were torn down. The Gate was erected in 1789–1790 and is a copy of the Propylaea at Athens, 201 feet high and sixty-four feet long. There are five passageways into Unter den Linden through the Gate; the middle one was formerly reserved by courtesy for the sole use of the royal family. After Unter den Linden the principal streets are the Friedrich, Leipziger, Potsdamer, Wilhelm, König and Kaiser-Wilhelm.

The most imposing building is perhaps the royal palace, erected by Frederick the Great and later the imperial residence of William II. It contains over 600 rooms, and has one of the most gorgeous throne rooms to be found in Europe. It was severely damaged in 1919 by revolutionists. Opposite the palace are the old and new national museums; to the east of these is the national gallery. These three buildings are among the most imposing of any in Germany. Among those not connected with the government the Royal Theater (Schauspielhaus), the City Hall (Rathaus), the Exchange, the Deutsche Reichsbank and the new Reichstag building are prominent. The latter is the architectural triumph of the city.

Monuments. As is to be expected in the capital of a militarist nation, the monuments reflect the war spirit, and they are numerous and magnificent. Possibly the most notable is the equestrian statue of Frederick the Great. Next in size is the statue of Frederick Wilhelm, the Great Elector; others of imposing appearance are those of Frederick William III and Bismarck, and a great monument to William I. The Column of Victory commemorates the successes in the Franco-German War of 1870–1871. On one of the bridges of the city are eight heroic groups portraying the lives of soldiers of the empire. Before the opera house is a group of five German generals. Among the monuments to civilians is one to Luther.

Education. Berlin is a great center of education. The foremost institution of higher learning is the University of Berlin (see below); next in importance is the Institute of Technology; others are the Royal School of Agriculture, the Royal School of Music, the Royal Academy of Arts, the Military Academy and the Artillery and Engineering School.

Manufacture and Commerce. Before the World War every commodity known to the business world was made in the city. The war closed many factories, but Berlin suffered possibly less than some other cities in the empire. Previous to 1914 the leading industries were cloth printing and dyeing; next came the steel industry and manufacture of clothing. Berlin's central location and its many radiating railroads give it a strong position in commerce and transportation. Twelve main lines of railroad enter the city; their chief traffic in normal times is in coal, grain, cattle and wool.

Municipal Affairs. Berlin's streets are among the cleanest in the world, and are kept so by very strict regulations. Two abattoirs which cost $5,000,000 have done away with a thousand private slaughter houses, and these are regulated closely, assuring a clean meat supply. Municipal markets are conducted under a system which guarantees perfect sanitary conditions.

Government. Under the empire the city did not possess full freedom in its local government, for considerable municipal authority rested with the Prussian Minister of the Interior. The latter controlled the police, fire and building departments, the bureau of crimes and the issuing of passports. The local governing body had charge of drainage, street cleaning and lighting, the water supply and the care of the sick and the poor.

History. The oldest parts of Berlin were originally poor villages which first rose to importance under Markgraf Albert (1206–1220). The first important improvement was made by the great Elector Frederick William, who laid out the Unter den Linden, and in whose time the city had 20,000 inhabitants. Under his successors, Frederick I and Frederick the Great, the city was rapidly enlarged and improved. In 1871 Berlin became the capital of the German Empire. After nearly half a century of progress and prosperity, the city became the focus of German war enthusiasm. During the first three years of the war news of conditions in the capital were carefully guarded from the world outside, but there was apparently little disorder. The last year of the war, however,

witnessed strikes and other expressions of discontent, and on the surrender of Germany to the allies the city was one of the centers of the revolutionary uprising that overthrew the empire. Subsequently Berlin was the scene of riots and street fighting arising from the attempts of the Spartacans (radical Socialists) to obtain control of the government. In the course of this civil strife Karl Liebknecht and Rosa Luxemburg, Spartacan leaders, were killed. See GERMANY; WORLD WAR.

BERLIN, N. H., a city of Coos County, on the Androscoggin River and on the Grand Trunk and the Boston & Maine railroads. The city is beautifully located near the base of Mount Washington. It has valuable water power; one of the largest pulp mills in the United States is located here, and there are also paper mills, lumber yards, a knitting mill, foundries and shoe factories. Population in 1910, 11,780; in 1917, 13,892 (Federal estimate).

BERLIN, UNIVERSITY OF, one of the most famous universities in the world, established at Berlin in 1810, during the reign of Frederick William III, and at the suggestion of Wilhelm von Humboldt, who was then minister of education. The university includes departments of theology, jurisprudence, medicine and philosophy, which includes arts and sciences. It also has in connection with it several institutions, such as the institutes of physics and physiology, clinics, seminaries and museums. It is supported by the State, and is under the control of the minister of education. The instructors and professors number about 400, and the usual attendance in peace times is 11,000. Students of all nationalities are admitted, and women, except those of Germany, are admitted to certain departments under some restrictions. The library contains 160,000 volumes, besides a large number of pamphlets and theses.

BERLIN DECREE. See CONTINENTAL SYSTEM.

BERLIOZ, *bare'le ose*, HECTOR (1803–1869), a French composer, the leader of the modern, or Romantic, school of music in his native country. He forsook medicine to study music at the Paris Conservatoire, where he gained the first prize, in 1830, with his cantata, *Sardanapale*. Thereafter he achieved a wide reputation for the composition of so-called *program music*, in which a story is realistically expressed by the music. His symphony, *Herold en Italie*, his opera, *Les Troyens*, and his dignified *Te Deum* are now considered masterpieces, though scarcely recognized during his lifetime.

BERMU'DA GRASS, a grass cultivated in the West Indies, United States and Europe. It is a valuable fodder and lawn grass in warm climates where the soil is not very wet. In well-adapted soil it reaches a height of one to two feet. It resists heat and drought, therefore remains green after other grasses are dry. Bermuda grass will not ripen in the United States except in the South.

BERMUDA ISLANDS, or **SOMERS ISLANDS**, a cluster of over 300 very small coral islands in the Atlantic Ocean, only twenty of which are inhabited. They belong to Great Britain, and have an area of about twenty square miles. They are farther north than any other islands of like formation, due to the warm water of the Gulf Stream. Their location is 580 miles east of North Carolina. The Bermudas are politically important because they are about midway between the West Indies and the British possessions in North America. They are a favorite resort for winter visitors from the United States and England. Bananas, onions and sweet potatoes are the principal articles of produce.

The islands were first discovered by Juan Bermudez, a Spaniard, in 1522, and the first settlement was made in 1609 by Sir George Somers, an Englishman. They form an important British naval and military station. Population in 1914, 20,443, of whom only 7,137 were white. Hamilton, the capital, has 2,627 people.

BERN, or **BERNE**, *burn*, SWITZERLAND, capital of the canton of Bern, and since 1848, of the whole Swiss Confederation. It is situated more than 1,700 feet above the sea and is nearly surrounded by the River Aar. No other city in Switzerland excels it in beauty, and it is among the most regularly built towns in Europe. Among the public buildings are the great Gothic cathedral, built between 1421 and 1502; the church of the Holy Spirit; the federal-council buildings, or parliament house, commanding a splendid view of the Alps; the university; the town house, a Gothic edifice of the fifteenth century, and the mint. Bern has an academy, several literary societies and an excellent public library. The manufactures are woolens, linens, silk stuffs, stockings, watches,

clocks and toys. Bern became a free city of the Empire in 1218, and in 1353 it entered the Swiss Confederacy. During the World War it was the Swiss center of German propaganda. Population, 1910, 85,264.

BERNADOTTE, *bur na dot'*, JEAN BAPTISTE JULES. See CHARLES XIV, JOHN.

BERNARD, *bur'n'rd* or *bur nahrd'*, SAINT (1091–1153), of Clairvaux, one of the most influential ecclesiastics of the Middle Ages, born at Fontaine, Burgundy. Luther said of him, "If there ever lived a God-fearing and holy monk, it was Saint Bernard." He became a monk at Citeaux, and was the first abbot of Clairvaux, the great Cistercian monastery near Langres. Seventy-two monasteries owed their foundation or enlargement to him, and he left a great quantity of religious writings. It was due to his eloquent appeals that the Second Crusade was undertaken (see CRUSADES).

BERNHARDT, *bern'hart*, ROSINE, called SARAH (1844–), one of the greatest actresses, not only of her own age, but of all time. Perhaps the most remarkable fact in the career of the "Divine Sarah," as an appreciative public learned to call her, is that her genius remained undimmed through more than half a century. Her professional début was made in 1862, but as late as 1918 she was appearing before delighted audiences.

Madame Bernhardt was born in Paris, of Jewish descent. She was baptized as a Christian, according to her father's wish, and spent the early years of her life in a convent. Upon entering the Paris Conservatory in 1858, she received second prizes in tragedy and comedy. Her professional début was made in Racine's *Iphigenia*, but her first real success was in *Ruy Blas*, in 1867. In 1872 she was recalled to the Theatre Français, where she had previously failed, and soon afterward she achieved a distinct triumph in *Le Sphinx*, and later as Doña Sol in Victor Hugo's *Hernani*. She appeared in London in 1879 and aroused great enthusiasm, and shortly afterward she made a very successful tour of the United States.

SARAH BERNHARDT

Thereafter Madame Bernhardt appeared successively in *Fedora, La Tosca, Gismonde* and *La Samaritaine*. She toured the United States in *L'Aiglon* with Coquelin, with the same remarkable success that she had achieved on former visits. In later American tours she appeared in *Le Femme de Claude, Phedre, Magda, Sapho, La Dame aux Camelias, Fedora, La Tosca* and *Adrienne Lecouvreur*, and everywhere won highest praise. She also found time to appear in a moving picture play called *Queen Elizabeth*.

During her American tour of 1913 the gifted actress suffered an accident that made necessary the amputation of a leg. After a brave fight she regained her strength and accustomed herself to the use of an artificial limb. Again, in 1917, she underwent a serious operation, and her life was for a time despaired of, but after her recovery she returned to the stage with undaunted spirit. During 1918 she visited some of the American cantonments and entertained the soldiers of the national army. Madame Bernhardt has mastered the technique of her profession, and her portrayal of any rôle represents perfection of artistic acting. She is also a gifted sculptor, painter and writer. On January 13, 1914, she was admitted to the Legion of Honor, the first member of the theatrical profession to receive that distinction.

BERNINI, *ber nin'i*, GIOVANNI LORENZO (1598–1680), an Italian sculptor and architect, who was honored in his own time as one of Italy's foremost artists. He succeeded Maderna in 1629 as architect of Saint Peter's, completed the Barberini Palace, made the celebrated tomb of Urban VIII in Saint Peter's, and also submitted to King Louis XIV of France a design for the construction of the Louvre. Another notable achievement was the restoration of the Bridge of Sant' Angelo, in Rome. For half a century he was the favorite artist of the Popes, and he designed or made fifty works of architecture, fifty-eight statues and thirty-seven busts. Modern authorities criticize his art because of its lack of simplicity, but his portrait busts are worthy of highest praise.

BERN'STORFF, COUNT JOHANN HEINRICH VON (1862–), a German diplomat whose fame became worldwide during the later years of his residence in Washington

as ambassador from the German Empire to the United States. After serving in the German army the required time he entered the diplomatic service. His first post was that of attaché at Constantinople. Then he was for a time in the foreign office at Berlin, after which he was secretary of the German legations in various European capitals. Brief terms as councilor of the embassy at London and as minister to Egypt were followed by appointment as ambassador to the United States, in 1908. In this post he served until February, 1917.

No more popular ambassador lived in Washington until the year 1914. During the two and one-half years of America's neutrality in the World War the relations between the United States and Germany were extremely delicate. For a time it was believed that Bernstorff sincerely tried to act honorably in the numerous crises which developed and that he wished to preserve peace between the two nations. The United States government handed him his passports as soon as diplomatic relations between the two countries were severed; it was soon announced that he had been director of Germany's spy system throughout North America. The kaiser at once appointed him ambassador to Turkey, and at the close of the war he returned to Berlin. During the preliminary sessions of the Peace Conference Bernstorff acted as head of the Foreign Office Bureau, collecting material for presentation to the Conference. Later he served as adviser on peace negotiations.

BERSAGLIERI, *ber sa lya're*, a corps of Italian sharpshooters, organized early in the reign of Victor Emmanuel, by General Alessandro della Marmora. Two battalions took part in the Crimean War, and the corps has been continued through new enlistments. Particularly efficient they proved themselves in the World War in their onslaughts upon the Austrians. They are the "show" soldiers of the Italian army, and at reviews they execute all movements at a sharp run.

BERTILLON, SYSTEM, *bar te yoN'*, a system for the identification of criminals, invented by Doctor Bertillon, Paris, in 1879 and published in 1885. The means used are of two forms, (1) *anthropometrical*, consisting of measurements of the human body, especially of the bones (since they never change in adults), and finger print identification; (2) *descriptive*, giving general accounts of the prisoner's appearance, including eyes, hair, complexion and special marks or deformities. These descriptions are classified and filed. See FINGER PRINT IDENTIFICATION.

BERYL, *ber'il*, a colorless, yellowish, bluish or less brilliant green variety of emerald, the prevailing hue being green of various shades, but always pale. The crystals, which are six-sided, are usually longer and larger than those of the precious emerald, and its structure is more distinctly foliated. The best beryls are found in Brazil, in Siberia, Ceylon and on the frontiers of China. Beryls are also found in the United States, particularly in North Carolina and in smaller quantities in New Hampshire. Some of the finer and transparent varieties of it are often called *aquamarine*. These are found in the United States in Massachusetts and North Carolina. See AQUAMARINE.

BESANT, *be·zant'*, SIR WALTER (1836–1901), an English novelist and critic, whose best known novel, *All Sorts and Conditions of Men*, dealt with life in the East Side of London and resulted in the building of the People's Palace in East London. He was born at Portsmouth and educated at King's College, London, and Christ's College, Cambridge. After serving as senior professor of mathematics in the Royal College of Mauritius from 1861 to 1867, he returned to London and formed a literary partnership with James Rice. Among the novels which they produced together are *Ready Money Mortiboy, The Golden Butterfly* and *The Seamy Side*. After the death of Rice, Besant wrote, besides his best known work, *Dorothy Foster, The Orange Girl* and *The Alabaster Box*. He was the founder of the Society of Authors, and the editor of the *Author*, the publication of the society. In 1895 he was knighted by Queen Victoria.

BESSARABIA, *bes a ra'bi a*, between 1878 and 1918 the most southwesterly province of Russia. In the latter year, when Rumania, deserted by Russia in the World War, was forced to make peace, Germany compelled it to cede the rich Dobrudja to the Teutonic powers; in return the despoiled country was promised the southern half of Bessarabia. In that portion there are few Rumanians, but the northern section contains many. The entire province voted to join Rumania, in May, 1918, and at the close of the war

it proclaimed its union with the reorganized state. The final status of Bessarabia was left to the decision of the peace conference which closed the war.

The entire province has an area of 17,600 square miles, about twice that of Massachusetts, and the population exceeds 2,400,000. It has suffered many changes in ownership, and consequently its peace and security have been continually interrupted. It came under Turkish rule in 1503, and was conquered by Russia in 1770; by the Peace of Bucharest in 1812 the latter's title was confirmed. The southeastern portion was given to Turkey in 1856, but by the Treaty of Berlin in 1878 this was restored to Russia. The capital is Kishinev, the scene of numerous Jewish massacres.

BESSEMER, *bes'e mer*, ALA., founded in 1887 in the coal and iron region of the state, is eleven miles southwest of Birmingham, on seven railroads, the principal ones being the Louisville & Nashville, the Alabama Great Southern, the Southern and the Alabama, Birmingham & Atlantic. The industries are nearly all connected with the manufacture of iron and steel. Since 1910 the corporation limits have been extended to include Jonesboro. Population, 1910, 10,864; in 1917, 17,156 (Federal estimate).

BESSEMER, HENRY (1813–1898), an English engineer and inventor, born in Hertfordshire, chiefly known in connection with the process for making steel, which bears his name—a process which effected a revolution in the steel trade. This discovery was one of the most important of the nineteenth century, and to it is due the use of steel in the frames of buildings and in railroad rails. Bessemer distinguished himself by many other inventions and scientific improvements. He discovered a new process for the manufacture of bronze powder and made a number of important improvements in type-casting machinery. In 1879 Bessemer received the honor of knighthood. See STEEL, subhead *Bessemer Steel*.

BE'TEL, *or* **BE'TLE**, the name of two different Asiatic plants—the betel palm and the betel vine. The betel palm is a graceful tree, usually forty to fifty feet high and eighteen inches in circumference. It is the commonest and most important of the areca palms (see ARECA). Its fruit, the betel nut, which is about the size of a small hen's egg, has a fibrous shell, and the seed, enclosed in the shell, is the betel nut which is chewed by the natives of Oriental nations. It has been estimated that one-tenth of the world's population indulge in betel chewing.

BETEL PALM

The seeds are boiled in water, cut into slices and dried in the sun. These slices are then wrapped in leaves of the betel vine, a creeping plant of the pepper family, and a small piece of shell lime, cardamom or other flavoring material is added. The pellet is hot and acrid, but has aromatic and astringent properties. It tinges the saliva, gums and lips a brick-red, blackens the teeth and causes them to decay rapidly. It is doubtful if any good comes from its use, even as an aid to digestion, as claimed, but the custom is so universal with men, women and children, and so continuous, that the proper handling of betel is an important portion of the etiquette in every ceremonial meeting. The betel is too biting for pleasure to a person not used to it, and it makes one dizzy and sleepy.

A number of different plants nearly related to the peppers, the leaves of which have similar properties, are extensively cul-

tivated and are used by the natives in the same way. Where the climate is not suitable, because of dryness or cold, the vines are cultivated under sheds.

BETH'ANY (now called El-Azariyeh, or Lazarieh), anciently a village of Palestine, at the base of Mount Olivet, about two miles east of Jerusalem. It was the home of Martha, Mary and Lazarus, and was near the place where the ascension of our Lord is said to have taken place.

BETH'EL, a place mentioned frequently in the Old Testament, supposed to have been located about twelve miles north of Jerusalem. There Abraham pitched his tent, and Jacob wrestled with the angel, as related in the book of *Genesis*. The name means *house of God*.

BETHESDA, *be thez'da*, meaning *house of mercy*, was a pool in Jerusalem, near Saint Stephen's Gate and the Temple of Omar. In Bible times it was believed that its waters had healing powers. It is 460 feet long, 130 feet broad and seventy feet deep, and is now known as Birket Israel. In the fifth chapter of *John* there is an account of Christ's healing a lame man at the pool.

BETH'LEHEM, meaning *house of bread*, is the name of a town of Palestine, situated five and one-half miles southwest of Jerusalem, and memorable as the birthplace of Christ. The present town on the site is called Beit Lahm. There are three convents, one each for Roman Catholics, Greeks and Armenians. A richly adorned grotto, lighted with silver and crystal lamps, under the choir of the fine Church of the Nativity, is shown as the actual spot where Jesus was born. The chief trade of the place is in crosses, beads and relics. The town was occupied by the British in 1917, on their march to Jerusalem. Most of the inhabitants are prosperous and progressive Christians. Population, about 11,000.

BETHLEHEM, Pa., in Lehigh and Northampton counties, fifty-five miles north of Philadelphia, on the Lehigh Canal and Lehigh River, and on four railroads—the Lehigh Valley, the Central of New Jersey, the Philadelphia & Reading and the Lehigh & New England. Crossing the river are two bridges 700 and 1,100 feet long. The town is widely known as a steel-making center; there are also manufactures of silks, knit goods, hosiery and paint. The Church of the Nativity is an imposing structure, and there is a public library and a hospital. West Bethlehem was annexed in 1904. Population, 1910, 12,837; in 1917, 14,353 (Federal estimate).

BETHMANN-HOLWEG, *bate'man hol'vayK*, Theobald Theodore von (1856–), the fifth Chancellor of the German Empire. He was appointed to the post in 1909 and retained it until driven from power during a critical period of the World War, resigning in July, 1917.

As the representative of the emperor, to whom alone the Chancellor was responsible, he opposed the vote of the Reichstag calling for peace without annexations or indemnities, although personally favorable to it. Dr George Michaelis succeeded him, Bethman-Holweg was opposed to the policy of torpedoing vessels without warning, and through his efforts peace was maintained with the United States for nearly two years after the sinking of the Lusitania.

Early in life he entered the public service, becoming provincial president of Potsdam, then president successively of the governments of Bomberg and Brandenburg. In 1905 he was appointed Minister of the Interior and Vice-Chancellor, under Bülow, and succeeded the latter as Chancellor four years later.

BEVERIDGE, *bev'er ij*, Albert Jeremiah (1862–), an American statesman, for twelve years a United States Senator from Indiana. He was born on a farm in Ohio. He went with his parents to Illinois soon after the close of the Civil War, and later moved to Indiana, where he attended De Pauw University, graduating in 1885. He studied law, and after his admission to the bar he rapidly attained prominence. In the Senate, which he entered in 1899, as a Republican, he was known as one of the most forceful speakers in that body. In 1912 he was the Progressive candidate for governor of Indiana, but was defeated.

BEYROUT, *ba'root*. See Beirut.

BHUTAN, *bu tahn'*, an independent state in India, north of Bengal and south of the Himalaya Mountains. It contains 16,800 square miles—is about half as large as Maine—and a population of 250,000, of the Bhotias race, who are Buddhists. Corn, rice, wheat and buckwheat are raised, although not all of the country is fertile. The government is under the dual control of the clergy and the laity. The commerce is entirely with India.

Form of early Bible

BIBLE, the book that today, in part or in whole, is the religious guide of nearly one-third of the human race. Of all books, secular or religious, it has had by far the widest distribution over the world. The whole Bible or portions of it have been translated into 400 languages and dialects, and it is read by natives of the Pacific islands, by the American Indians, by remote tribes in Africa, by Japanese, Chinese, Arabians, Persians, the inhabitants of India and many other peoples. A traveler journeying over the globe would find few inhabited regions in which the Bible was unknown, though he might notice the lack of countless articles considered essential to his comfort at home.

This unique book is really a library, or collection of books. The name is derived from the Latin *biblia,* which in turn is a transcription of a Greek word meaning *little books.* The modern singular form therefore reminds us that the Bible is an entity, while the Greek plural emphasizes the fact that it is "many books in one." Its two general divisions are the Old and the New Testament, the former dealing with Jewish history before the time of Christ. Christians alone accept as inspired writings the books of the New Testament. Altogether there are sixty-six books.

Books of the Old Testament. The books of the Old Testament, thirty-nine in number, are as follows:

Genesis	Ezra	Daniel
Exodus	Nehemiah	Hosea
Leviticus	Esther	Joel
Numbers	Job	Amos
Deuteronomy	Psalms	Obadiah
Joshua	Proverbs	Jonah
Judges	Ecclesiastes	Micah
Ruth	Song of Solomon	Nahum
I and II Samuel	Isaiah	Habakkuk
I and II Kings	Jeremiah	Zephaniah
I and II Chronicles	Lamentations	Haggai
	Ezekiel	Zechariah
		Malachi

The first five of these books are grouped together as *books of the law* (Pentateuch); those from *Joshua* to *Esther,* inclusive, are *historical books; Job, Psalms, Proverbs, Ecclesiastes, Song of Solomon* and *Lamentations* are poetry; the sixteen remaining are prophecies, and are subdivided into *greater* and *minor.* The authorship and date of all of these books cannot be stated positively. It was long believed that Moses wrote the books of the law and that David was the sole author of *Psalms,* but modern scholarship rejects both of these suppositions. While there is considerable evidence for assigning definite authors to some of the Old Testament writings, the authorship of many of the books is unknown.

Books of the New Testament. It is not a difficult matter to divide the twenty-seven books of the New Testament into three logical groups. The first five books—*Matthew, Mark; Luke, John* and *Acts of the Apostles*—are historical, relating to the life of Christ and the labors of His followers who planted the new Church in Jerusalem and abroad. Then come the epistles, many of which are the work of Paul, and finally the prophetic vision of John, called the *Book of Revelation.* The complete list is as follows:

Matthew	I. Timothy
Mark	II. Timothy
Luke	Titus
John	Philemon
The Acts	To the Hebrews
Romans	Epistle of James
I. Corinthians	I. Peter
II. Corinthians	II. Peter
Galatians	I. John
Ephesians	II. John
Philippians	III. John
Colossians	Jude
I. Thessalonians	Revelation
II. Thessalonians	

The Apocrypha. There are a number of sacred books not accepted by Protestants as authorized parts of the Bible, and to these the name Apocrypha has been applied. They are, however, accepted by the Roman Catholic Church. Se APOCRYPHA.

Bible Versions. The earliest and most famous version of the Old Testament is the Septuagint, or Greek translation, executed by Alexandrian Greeks, and completed probably before 130 B. C. This version was adopted by the early Christian Church and by the Jews themselves and has always held an important place in the interpretation and history of the Bible. The Syriac version, the Peshito, made early in the second century after Christ, is celebrated for its fidelity. The Coptic version was made from the Septuagint, in the third or fourth century.

The Gothic version, by Ulphilas, was made from the Septuagint in the fourth century, but mere insignificant fragments of it are extant. The most important Latin version is the Vulgate, executed by Jerome, partly on the basis of the original Hebrew, and completed in A. D. 405.

The printed editions of the Hebrew Bible are very numerous. The first edition entire was printed at Soncino in 1488.

The books of the New Testament were all written in Greek, unless it be true, as some critics suppose, that the gospel of *Saint Matthew* was originally written in Hebrew. Most of these writings have always been received as inspired; but the *Epistle to the Hebrews*, commonly ascribed to Saint Paul, that of Saint *Jude*, the second of *Peter*, the second and third of *John* and *Revelation* have been doubted. The three oldest manuscripts are: 1, the Sinaitic manuscript, discovered by Tischendorf in a convent on Mount Sinai in 1859, assigned to the middle of the fourth century; 2, the Vatican manuscript at Rome, of similar date; 3, the Alexandrian manuscript in the British Museum, assigned to the latter half of the sixth century. Each manuscript contains also in great part the Septuagint Greek of the Old Testament. The division of the text of the New Testament into chapters and verses was introduced later than that of the Old Testament, but it is not precisely known when or by whom.

Of translations of the Bible into modern languages the English and the German are the most celebrated. Considerable portions were translated into Anglo-Saxon, including the Gospels and the Psalter. Wycliffe's translation of the whole Bible (from the Vulgate), begun about, 1356, was completed shortly before his death, 1384. The first printed version of the Bible in English was the translation of William Tyndale, whose New Testament was printed in quarto at Cologne in 1525, a small octavo edition appearing at the same time at Worms. He also published the Pentateuch in 1530 and translated some of the prophetical books. Our translation of the New Testament is much indebted to Tyndale. A translation of the entire Bible, undertaken at the instance of Thomas Cromwell, was published by Miles Coverdale in 1535 and, being made from German and Latin versions, was inferior to Tyndale's.

The first Bible printed by authority in England was an edition with a preface by Cranmer, hence called *Cranmer's Bible*. A royal proclamation in 1540 ordered it to be placed in every parish church. This continued, with various revisions, to be the authorized version till 1568. In 1557–1560 an edition appeared at Geneva, based on Tyndale's—the work of Whittington, Coverdale, Goodman, John Knox and other exiles, and commonly called the *Geneva*, or *Breeches, Bible*, from "breeches" standing instead of "aprons" in *Genesis* III, 7. This version, the first printed in Roman letters, and also the first to adopt the plan, previously adopted in the Hebrew, of a division into verses, was for sixty years the most popular in England and was allowed to be printed under a patent of monopoly in 1561. It omitted the Apocrypha, left the authorship of the *Epistle to the Hebrews* open and put words not in the original in italics. The *Bishop's Bible*, published 1568 to 1572, revised by Archbishop Parker and eight bishops, succeeded Cranmer's as the authorized version, but did not commend itself to scholars or people. In 1582 an edition of the New Testament, translated from the Latin Vulgate, appeared at Rheims, and in 1609–1610 the Old Testament was published at Douai. This is the version recognized by the Roman Catholic Church.

King James's Version. In the reign of James I a Hebrew scholar, Hugh Broughton, insisted on the necessity of a new translation, and at the Hampton Court Conference (1604) the suggestion was accepted by the king. The work was undertaken by forty-seven scholars, divided into six companies, two meeting at Westminster, two at Oxford and two at Cambridge, while a general committee meeting in London revised the portions of the translation finished by each. The revision was begun in 1607 and occupied three years, the completed work being published in folio in 1611 and known as *King James's Bible*. Through the general accuracy of its translation and the purity of its style, it superseded all other versions. In response, however, to a widespread desire for a translation even freer from errors, the Convocation of Canterbury in 1870 appointed a committee to consider the question of revising the English version. Their report being favorable, two companies were formed, one for the Old Testament and one for the New, consisting partly of members of the Convocation and

partly of outside scholars. Two similar companies were also organized in America, to work along with the British scholars. The result was that the revised version of the New Testament was issued in 1881; that of the Old Testament appeared in 1884. An *American Revised Version* appeared in 1901.

The Bible as Literature. Macaulay says in one of his essays, "If everything else in our language should perish, the English Bible alone would suffice to show the whole extent of its beauty and power." There are so many passages of high literary quality in the "Book of Books" that innumerable citations could be made to show the beauty and power of its language. Several passages from *Isaiah,* for example, were used by Handel as a setting for the matchless music of his *Messiah,* and the rhythm in each case is perfectly adapted to the noble melody. The *Psalms,* too, have been chanted and sung for centuries.

There are countless examples of beautiful figures of speech in the Bible, and practically every form of literature is found in its pages—the epic, the allegory, the parable, the short story, the historic narrative, the song of rejoicing, the dirge, and so on. Secular literature is permeated with allusions to the Bible, and whoever would aspire to a general culture cannot afford to ignore this great literary monument.

Related Articles. Consult the following titles for additional information:

Aaron
Abel
Abraham
Absalom
Acts of the Apostles
Adam and Eve
Ahab
Ahasuerus
Ahaz
Amos
Ananias
Apocalypse
Apocrypha
Ark
Baal
Babel, Tower of
Balaam
Barnabas
Bartholomew
Beelzebub
Caiaphas
Cain
Calvary
Canaanites
Chronicles, Book of
Cities of Refuge
Corinthians, Epistle to
Daniel
David
Deborah
Decalogue
Delilah
Deluge
Douai Bible
Ecclesiastes
Eden
Edom
Eli
Elijah
Elisha
Ephesians, Epistle to
Esau
Esther
Ezekiel
Ezra
Felix, Antonius
Festus, Porcius
Gabriel
Gamaliel
Gath
Gehenna
Gideon
Goliath
Goshen
Gospels
Habakkuk
Haggai
Hallelujah
Ham
Herod
Herod Agrippa I
Herod Agrippa II
Herod Antipas
Hezekiah
Hittites
Hosea
Isaiah
Ishmael
Jacob
James, Saint
Japheth
Jehoshaphat
Jephthah
Jehovah
Jehu
Jeremiah
Jeroboam
Jerusalem
Job
Joel
John, the Baptist
John, Saint
Jonah
Joseph
Joseph of Arimathea
Joshua
Josiah
Jubilee
Judah
Judas
Jude
Judges, Book of
Lamentations
Lazarus
Leviathan
Levites
Leviticus
Lucifer
Luke, Saint
Magdalen, Mary
Malachi
Manna
Mark, Saint
Mary, The Virgin
Matthew, Saint
Michael, Saint
Miracle
Moabite Stone
Moses
Nehemiah
Noah
Numbers, Book of
Passover
Patriarchs
Paul
Pentateuch
Pentecost
Peter
Pharisees
Philip
Philistines
Pilate, Pontius
Proverbs, Book of
Psalms, Book of
Ruth, Book of
Sadducees
Samaritans
Samson
Samuel
Sanhedrin
Saul
Scapegoat
Septuagint
Sinai
Sodom
Solomon
Tabernacle
Tabernacles, Feast of
Targum
Thessalonians, Epistle to the
Thomas, Saint
Timothy
Titus
Vulgate
Zebulun
Zedekiah
Zephaniah

Bible Stories. The stories which follow include some of the most valued and best loved narratives of the Old Testament. This material gives a picture of the Israelitish people from the settlement of Abraham in the Land of Canaan to the period after the capture of Jerusalem by Nebuchadnezzar. No special attempt has been made to emphasize the moral teachings of these stories, for in most cases the lesson lies in the heart of the story. The literal language of the Bible has been replaced by a style which children and young people will understand and enjoy.

These stories, which have been carefully selected, will provide excellent material for the mother accustomed to having a daily story-telling hour with her children. Bible narratives are full of action, they abound in character portrayal, and they make an appeal to the emotions which humanity experiences today. They are valuable both for their spiritual and for their educational appeal. No child can listen unmoved to the story of David's slaughter of the giant Goliath, or the rescue of little Moses in his cradle on the water. By telling Bible stories to her children the mother instills in their young minds a fondness for the literature of the Scriptures, and so prepares the way for a deeper acquaintance with the greatest religious writing ever produced.

Stories From The Old Testament

EARLY STORIES OF THE HEBREWS

Abraham and Isaac

In the early days of Bible story there lived in the land of Ur of the Chaldees a man named Abram. Ur of the Chaldees was a city of Mesopotamia, which is the land between the Euphrates and the Tigris rivers, in Western Asia. There is today a ruined temple on the west bank of the Euphrates River, at the place where a canal joins that stream and the Tigris, and Bible students tell us that in the time of Abram Ur lay at the point where the temple may be seen. Abram was a rich man; he owned large herds of cattle and flocks of sheep, and he had many servants. But there came a time when it was revealed to him that he must depart from the country of Mesopotamia and go to a land called Canaan, on the eastern shore of the Mediterranean Sea. It would be interesting to trace on a map that long, toilsome journey over desert, stream and mountain. After he had settled in his new home, God told him that he was to be the father of a chosen people, and that his descendants were to possess all the land of Canaan. Kings were to come from his race, and he himself was to be called Abraham, which means "father of a multitude." A son, too, was promised him, for Sarah, his wife, was childless.

When, at last, a little son was born to Abraham and Sarah, they were so happy they named him Isaac, for Isaac means "laughing." The child became a great comfort to his parents, and Abraham loved him above all other things. In those days men offered up sacrifices as a part of their religious duty. Very often they would kill a choice lamb out of the flock, and burn it on the altar as a sacrifice. One day God spoke to Abraham and said, "Take thy son Isaac, whom thou lovest, and go to the land of Moriah; thou must offer him there as a burnt offering, upon a mountain which I will tell thee of." There is nothing in the Bible record to make us think that Abraham rebelled or complained when he received this strange command. Early in the morning he saddled his ass, gathered the wood for the offering, and departed with Isaac and two young men-servants. On the third day he saw a summit in the distance that he knew to be the place of sacrifice, and he said to his servants, "Wait here; I and the lad will go yonder and worship, and will come again to you."

Then Abraham and Isaac went on together; Isaac carried the wood, and his father bore the fire. The lad did not understand why they were going up to the mountain, and he said to Abraham, "Father, here is fire and wood, but where is the lamb for a burnt offering?" "My son," was the reply, "God will provide himself a lamb for a burnt offering." When they came to the place of sacrifice, Abraham built an altar, arranged the wood upon it, and then placed his boy on the wood. But just as he was about to lay his hand on him he heard a voice saying, "Abraham, Abraham." He answered, "Here am I." Then the voice said, "Lay not thine hand upon the lad: for now I know that thou fearest God." And Abraham knew then that God was testing him, to see whether he was willing to give up the dearest treasure he possessed. But he was not required to give up his son, for as he looked about him he saw a ram caught in a thicket by the horns, and he took the ram and offered it as a burnt offering. But because he had been obedient to the divine voice, and had not refused to give up that which he loved most dearly, Abraham received greater blessings than ever before.

The Marriage of Isaac

In the course of time Sarah died, and was buried in a cave which Abraham bought as a tomb for his family. Then, as he felt himself growing old, and saw his son Isaac grow to manhood, he said to himself that he would like to have Isaac married. Now most of the people who lived in the land of Canaan worshiped

idols, and Abraham decided that his son ought to seek a wife in Mesopotamia, where several of their kindred still lived. These far-away kinsmen believed in the true God, whom Abraham and Isaac worshiped. So Abraham called his oldest servant, the one who took care of his flocks and herds, and bade him go into that country and find there a wife for Isaac. Then the servant took ten of his master's camels and some beautiful gifts, and journeyed to the land in which Abraham had lived so many years before.

After a time the servant came near to a city in Mesopotamia which had a well outside the gate. It was just at the close of day, and the women were coming out of the city to draw water. The servant had his camels kneel down by the well to rest, and then he prayed to God to show him which one of the women that came to draw water should be Isaac's wife. It was revealed to him that he should ask one of them for water to drink, and if she answered kindly he would know she was the one to be chosen. While he was praying, a beautiful, dark-eyed girl named Rebekah, carrying a pitcher on her shoulder, came up to the well. And when she had filled her pitcher the servant ran up to her and said, "Let me, I pray, drink a little water out of thy pitcher." She answered, "Drink, and I will draw water for the camels also." Then she let down the pitcher from her shoulder and gave the servant a drink, and afterward she carried water to the camels. When Rebekah had performed these services the servant gave her a gold earring and two gold bracelets. He inquired whose daughter she was, and asked whether he and his men could sleep at her father's house. The young woman told him that she was the daughter of Bethuel, and that there was room at their house for all, and food for the camels. The servant rejoiced greatly when she told him these things, for he knew that Bethuel was a kinsman of Abraham, and that God must have guided him to their place.

THE SERVANT MEETS REBEKAH

Then Rebekah ran home and told her people all that had happened. Her brother Laban, when he saw the earring and bracelets, hastened at once to the well and invited the servant to come to their house and to bring his camels and their keepers. And they were all treated most kindly and made welcome. But before the servant would accept any food he told Rebekah's family who he was and why he had come to their city. And he begged them to say at once whether they would let Rebekah go home with him. As Bethuel and Laban listened to the story they felt it was God's will that Rebekah should be the wife of Isaac, and they at once consented to her going away. The happy servant, on hearing these words, brought out costly jewels of gold and silver and beautiful garments, and he gave Rebekah and her mother and brother many handsome gifts. Then they had a merry feast, and the next morning the travelers departed, taking with them Rebekah and her nurse.

As they were passing through the land of Canaan one evening, they came near to the place where Isaac was. He had gone into the fields to walk about by himself, and when he saw the train of camels he hastened toward the travelers. As he came nearer Rebekah noticed him and said to the servant, "Who is this man

walking to meet us?" When the servant told her that it was Isaac, she covered her face with a veil, and as soon as he came up to her she climbed down from her camel and Isaac took her into the tent his mother had lived in. He made her his wife, and he loved her so dearly that he was comforted for the loss of his mother. After the marriage Abraham gave all his herds and flocks to his son, and when he died Isaac buried him in the cave where Sarah rested.

THE TWO BROTHERS

A Story of Forgiveness

Jacob and Esau were the twin sons of Isaac and Rebekah. The two boys were very different in looks and in character, and, as sometimes happens in families to-day, one was the favorite of his father, and the other the favorite of his mother. Esau, the elder, was a rough, hairy fellow who grew up to be a famous hunter, while Jacob was content to stay at home and take care of his father's flocks. Esau would go into the fields and kill deer, and then bring back to his father the delicious venison. But the homeloving Jacob was the favorite of his mother. In those days the eldest son was the most important of all the children. He received the greater share of the cattle and other property when the father died, and was favored above all the other sons. This special favor was called the birthright. As Esau was older than Jacob, he was entitled to the birthright, but he did not appreciate it as he should have done. One day, after he had been out hunting, he came home faint and hungry. Jacob had just cooked a savory vegetable food called pottage, and when his brother saw it he said, "Give me, I pray, the pottage to eat, for I am very faint." But Jacob said, "Sell me this day thy birthright." Now Esau thought only of satisfying his hunger, and he said to himself, "If I do not get food to eat at once I will die, and what good will my birthright be to me then?" Thus he weakly yielded to the temptation and sold his precious birthright.

As the years passed by Isaac became feeble and his sight grew very dim. One day he said to Esau, "Take thy bow and kill a deer, that I may taste again the venison that I love. Then I will give thee my farewell blessing." This special blessing was bestowed in those days, on the eldest son, and was one of the privileges of the birthright. Esau gladly departed to do his father's bidding. Rebekah, however, had overheard Isaac's words, and she was displeased that Esau should be placed above her favorite, Jacob. Therefore, as soon as Esau was out of sight, she told Jacob to bring to her two small goats from the herd. When he had done so she cooked the meat and made it taste like the venison of which Isaac was so fond. Then she had Jacob dress himself in Esau's clothes, and she put the skins of the goats on his hands and his neck, that he might seem to be a hairy man like his brother. When Jacob told her he feared that a curse would come upon him for deceiving his father,

JACOB RECEIVING THE BLESSING

Rebekah replied, "Upon me be the curse, my son: only obey my voice." Then Jacob presented himself to Isaac, and

the aged man felt of the hairy hands and believed that his eldest son was before him, though his voice was the voice of Jacob. When he had eaten of the meat which Rebekah had prepared, Isaac drew his son close to him, smelled of his garments, which had the smell of woods and fields, and gave him the prized blessing.

On Esau's return from the hunt he prepared a savory piece of venison for his father, and offered it to him, begging for his blessing, as had been promised. Trembling and dismayed, the old man cried out, "Who art thou?" And when Esau told him that he was his first born son, Isaac knew that Jacob had stolen his brother's blessing. Exceedingly bitter was Esau's sorrow when he found out that he had been cheated, and in his anguish he cried, "Bless me, even me also, O my father." Isaac was indeed glad to bless him, but he had promised the best things to Jacob, and he dared not revoke his solemn words. Esau could not control his feelings of disappointment and anger, and it was soon reported to Rebekah that he had threatened to kill his brother. Therefore the mother advised Jacob to go away to the home of her brother Laban, in another country. And in due time Jacob departed. So we see that his selfishness and greed sent him into exile and separated him from all that he loved.

It was many years before the brothers met again. At the home of Laban Jacob received a kindly welcome, and he fell deeply in love with Rachel, the younger of his uncle's two daughters. Laban promised him that if he would serve him for seven years he could have Rachel for his wife, and so great was Jacob's love for her that the seven years of service seemed short, indeed. But when the time was up Laban consented to the marriage only when Jacob promised to serve him another seven years. As time passed by Jacob prospered greatly, and many sons were born to him. Then, at the end of twenty years, he decided to return to his own country. So he gathered together his flocks and herds, and departed with his family and servants.

In all these years Jacob and Esau had never been reconciled, and as Jacob approached the place where his brother was living he sent men ahead with a friendly message, for he still feared his anger. The messengers told Esau of Jacob's prosperity during his sojourn with Laban, and of his hope that the past might be forgotten, but they returned with bad news. Instead of a message of friendship they came with a report that Esau was planning to meet his brother with four hundred men. That night Jacob prayed earnestly to God to save him from his brother's wrath, and the next day he sent his servants ahead of him with presents of goats and camels. When Jacob saw Esau approaching with the four hundred men he ran to meet him alone, and bowed down on the ground before him. All of Esau's anger melted away at sight of his brother, and he embraced him tenderly. Then they wept for joy that all was made right between them, and Jacob had his children come forward and greet their uncle. Esau asked about the droves and herds which had been sent ahead, and when Jacob told him they were gifts for him, he replied, "I have enough, my brother; keep that thou hast unto thyself." But Jacob insisted that he keep them, for he wanted his brother to know that the old spirit of greed had left his heart. The same day Esau departed to his own home, but Jacob journeyed on and came finally to Hebron, in Canaan, where his old father, still alive, was sojourning. The land of Canaan became his home once more, and there he reared twelve sons who became founders of the Twelve Tribes of Israel.

Of all the sons of Jacob, the one he loved most dearly and favored the most, was Joseph. There is a very interesting story about this son, who was sold into slavery because of the jealousy and cruelty of his older brothers. This story is told in detail in these volumes in the article STORY TELLING. It shows how the Israelities came to settle in Egypt, and is the connecting link between the story related above and the one which follows on the next page.

THE ISRAELITES DELIVERED FROM BONDAGE

The Descendants of Jacob in Slavery

During a time of famine the patriarch Jacob and all his people left the land of Canaan and took up their abode in Egypt. Jacob was then a very old man, and when he died his sons carried his body back to the old home and buried it there. But the children and grandchildren of the patriarch, to the number of about seventy, remained in the land of the Egyptian kings, who were known as Pharaohs. As the years passed by, the Hebrews, or children of Israel, as they are usually called, grew to be a great multitude of people, and the land of Egypt was filled with them. The Pharaoh who ruled in Jacob's time was kind and just to the Israelites, but later a king came to the throne who made slaves of them. "Behold," he said, "the people of the Children of Israel are more and mightier than we. We must keep them from multiplying or they will join our enemies and fight against us." So he set taskmasters over them, who treated them cruelly and forced them to build cities and labor in the fields. But they continued to grow in numbers.

Then Pharaoh told the women who took care of the little children of the Israelites to kill all the boy babies as soon as they were born, but they refused to do so wicked a thing. Next he ordered the Egyptians to cast into the river all the little boys who were of the despised race.

The Story of Moses

Among the Israelites there was a woman named Jochebed, who had a beautiful child that she was determined to save. She kept him hidden until he was three months old, and then, fearing that he would be discovered by Pharaoh's servants, she made a little ark out of some weeds that grew by the river. She covered the ark with asphalt and pitch, so that water could not enter it, and in it she placed her baby boy. Then she set the boat down among the rushes by the water's edge, and told her little daughter to watch it carefully. Not long afterward Pharaoh's daughter and some of her maids came down to the river to bathe. As the princess walked along the bank she noticed the queer little boat, and ordered one of her maids to bring it to her. When she opened it and saw the tiny child within she was moved to pity,

THE FINDING OF MOSES

for the little fellow began to cry. "This," she said, "is one of the Hebrew children." Then Miriam, the baby's sister, ran up and said, "May I not go and call one of the Hebrew women to nurse the child for thee?" "Go," said the princess, and Miriam ran to her own mother with the joyful news. Then when Jochebed came to Pharaoh's daughter the princess told her to take the child home and nurse it, and promised that she would pay for its keep. Later the boy was placed in the royal palace and was brought up as the adopted son of Pharaoh's daughter. She named him Moses, because that word means "drawn out," and she had drawn him out of the water.

When Moses had grown to manhood he did not forget his own people. As he went among them and saw the burdens they had to bear he longed to help them, and he felt that it was a greater honor to

be one of the Children of Israel than to be the rich and powerful son of a princess. It so happened that he went one day to a place where some Israelites were working, and saw an Egyptian cruelly beating a Hebrew. He could not bear to see one of his blood so mistreated, and he struck the Egyptian down and killed him. This act was reported to Pharaoh, and when he heard of it Moses had to flee for his life. After wandering for some time he came to the land of Midian, which lay in the Arabian desert. As he sat down by a well to rest, seven sisters came to the place to draw water for their father's flock. A band of rough shepherds tried to drive them away, but Moses came to the rescue of the sisters and also helped them water the sheep. These young women were the daughters of a priest named Jethro. When they arrived at home they told their father that an Egyptian had saved them from the shepherds, and had drawn water for them, and he bade them return to the well and invite the stranger to eat with them. It came to pass that Moses remained in the home of Jethro and helped him care for the flocks, and in the course of time he married one of Jethro's daughters.

During the time that Moses was in exile a new Pharaoh came to the throne of Egypt, but he was even more cruel than the king before him. And as the Children of Israel cried aloud in their misery, God heard them and took pity upon them. One day as Moses was tending the sheep on Mount Horeb, far out in the wilderness, he heard the voice of God speaking to him from a burning bush. He was told that God has seen the sorrows of the Israelites, and that he had been chosen to lead them out of the land of bondage into the country where Abraham and Isaac and Jacob had dwelt. This was Canaan, the Promised Land. Now, Moses was a modest man, and he feared that he would not be able to carry out so mighty an undertaking. But God promised to be with him at every step of the way, and to send his brother Aaron to help him. Aaron was a man of eloquence, and it would be his duty to tell the people what God should reveal to Moses. When he had heard these words, Moses returned to the home of Jethro and obtained leave to go to Egypt to see his people.

Then it was revealed to Aaron that he should go into the wilderness to see his brother, and he found him on Mount Horeb. When Moses had told Aaron all that had been shown him, the brothers departed to Egypt to fulfill their mission. Many trials and discouragements awaited them there. First they had to gain the trust of the chief men of the Israelites, and then win the confidence of the people themselves. After this they went to Pharaoh and said, "The Lord God of Israel asks that His children be permitted to go into the wilderness for three days to offer up a sacrifice." These words made Pharaoh very angry, and he not only refused to let the people go, but he added to their burdens. At this time the Israelites were digging clay out of the earth, and forming it into bricks. These bricks were dried and hardened in the sun. Now the clay had to be mixed with straw to make the bricks tough and strong, and the straw was collected in the fields by men who brought it to the workers. In his anger Pharaoh made a rule that brickmakers were to go into the fields and gather the straw themselves, but they must make just as many bricks as before. Of course the Israelites could not work so fast when they had to wander about the fields in search of straw, and their taskmasters called them idlers and beat them cruelly when they fell short of the required number.

The Escape from Egypt

When Moses heard of this he prayed to God for guidance, and was given a new promise that the people would surely be delivered from their bondage. But Pharaoh was hard and stubborn, and before he would consent to let the Israelites depart he saw his own people afflicted by terrible plagues, sent by God as a punishment. The first plague was that of waters of blood. Aaron, at Moses' command, lifted up his rod and smote the water in the river, and at once the waters all over the land

were changed into blood. Then all the fish died, and the people sought in vain for water to drink. For seven days this curse was on the land, but Pharaoh's heart remained hard, and he would not let the Israelites go. Then came the plague of frogs. God told Moses to have Aaron stretch forth his rod over the streams and rivers, and as he did so multitudes of frogs came up out of the waters and covered the land from one end to the other.

Then Pharaoh grew fearful and asked Moses and Aaron to intreat the Lord to remove the plague. And he said, "I will let the people go, that they may do sacrifice unto the Lord." But the next day, when he saw that all the frogs had died, he hardened his heart and would not keep his promise. Many other plagues tormented the land before Pharaoh repented. Men and beasts were covered with loathsome creeping things; swarms of flies filled the houses of the people; the cattle and horses and sheep were afflicted by a deadly disease; and there were plagues of boils, of hail and fire, of locusts and of black darkness. But God protected the Children of Israel from these dreadful things, and afflicted only the Egyptians.

At last the time came when the people were to depart from the land of bondage. Pharaoh still refused to let them go, and he had to suffer one final punishment for his stubborness. Moses told him that at midnight the angel of death would pass through the land and smite the eldest son in each household; that the king's eldest son would die, and the eldest son of each of his servants, and all over the land there would be cries of grief; but not one of the Israelites would be harmed.

Everything came to pass as Moses prophesied. A few days before the night of sorrow every man among the Children of Israel was commanded to take a lamb from the flock and keep it four days. Afterward he was to kill it in the evening, and to dip in its blood a bunch of the hyssop plant. Then he was to strike the plant upon each side of his door and above it, so that there would be three marks of blood on the outside of every house among the Israelites. And the lambs which had been killed were to be roasted, and the people in each house were to feast. The Israelites obeyed all of these commands, and at midnight of the night on which they feasted the death angel went through the land and caused the first born son in every Egyptian family to die. But he passed over the houses with marks of blood on the door, and in honor of this the supper of the lamb was called the Feast of the Passover.

When Pharaoh heard the cries of grief in his own house, and knew that there was sorrow in every Egyptian home in the land, he could bear no more. Therefore he called for Moses and Aaron and told them to go out of Egypt and to take all the Children of Israel with them. And in the morning the great host of people departed, with all their flocks and herds.

There were two ways to travel toward the Promised Land—a short way through the country of the Philistines, and a longer route by way of the Red Sea. God showed Moses that he was to lead the people across the Red Sea, for it would be dangerous to go through the land of the warlike Philistines. As they journeyed they were guided during the day by a cloud that always went before them, and seemed like a tall pillar reaching to heaven; but at night the pillar glowed like fire and gave them light.

It came to pass that after the Israelites had departed Pharaoh began to feel sorry that he had let them go. So he gathered together a great host of men in chariots and on horses, and they followed after the Israelites and overtook them on the shores of the Red Sea. When the people saw the great army coming towards them they were badly frightened and cried out to Moses, "Because there were no graves in Egypt must we be carried here to die in the wilderness?" But Moses calmed them and told them that God would not desert them. Then the cloud which traveled before the Israelites was moved that night from its place and came between them and Pharaoh's army, and the side of it which was turned towards the Egyptians grew dark, so that they could not see their way. But on the side toward the Israelites it glowed

like fire. Then God commanded the Israelites to move forward, and Moses was com-

MOSES AGAIN STRETCHED HIS HAND OVER THE WATERS

manded to lift up his rod and stretch out his hand over the sea. As he did so a strong east wind came up and blew all night, and the water of the sea swept back so that a dry path was left for the people to walk upon. And in the morning they walked across the path with a wall of water on the right of them and one on the left, and all came safely to shore on the other side.

When the Egyptians discovered that the Israelites had escaped them they followed them eagerly, but the wheels of their chariots came off, and they could not go fast. While they were on the path in the sea Moses again stretched his hand over the waters, and the waters that were piled up on either side came together. Then all of Pharaoh's army perished. On the other side of the Red Sea were the Israelites, and when they saw how they had been delivered they sang a song of thanksgiving, which began, "I will sing unto the Lord, for he hath triumphed gloriously; the horse and rider hath he thrown into the sea." Thus were the descendants of Jacob delivered from the land of bondage, after they had suffered in Egypt for many long years.

THE ISRAELITES ENTER THE PROMISED LAND

After the Children of Israel escaped from their bondage in the land of Egypt, they wandered for forty years in the Wilderness between the Red Sea and the Jordan River. Before they passed over the river into the Promised Land of Canaan, Moses, their devoted leader, died, but God chose a new guide for them—Joshua, the son of Nun—and they were not left leaderless. As the people came near to the boundaries of Canaan, Joshua sent two men ahead to view the country they were to occupy. These men crossed over the Jordan and went into the city of Jericho, which was the first place the Israelites were to capture. There they found refuge in the home of a woman named Rahab. It happened that someone told the king of Jericho that two spies from the Israelites were hidden in Rahab's house, and he sent word to the woman to deliver them up. But she took them up to the roof of her house, and hid them under some stalks of flax which were spread out to dry. And when the king's messengers came to take the spies away they could find no one. After the messengers had departed Rahab went up to the roof and told the men what she had done. She said she knew that the Children of Israel were about to take possession of Jericho, and she begged them to remember her kindness when their soldiers entered the place. The spies answered her kindly and suggested that she fasten a scarlet thread in the window of her house, so that when the Israelites came to take the city they would know which house was hers.

Jericho, like many other ancient cities, was surrounded by a wall. Rahab's house was built close to the wall and had a window overlooking it. It was therefore an easy matter for her to let down a rope from the window and help the two men to escape; for the gates of the city were

shut and locked by the king's servants, and the spies could not go out in the usual way. Then, following Rahab's advice, they hid in the mountains for three days, to wait until the search for them had ceased. And at the end of that time they

THE RETURN OF THE SPIES

crossed the Jordan and reported to Joshua in the camp of Israel.

Early one morning Joshua and his people marched to the banks of the Jordan and camped there for three days. On the morning of the fourth day they began to march across the river, with the priests at the head carrying the Ark of the Covenant. And as soon as the feet of the priests touched the water it parted before them, and they walked out on dry ground into the middle of the stream. There they stood with the Ark, waiting until the people had all passed over to the opposite shore, and after the passage had been made the waters flowed together again. The Israelites were now in the land of Canaan, not far from the city of Jericho, which the Lord desired they should possess.

God revealed to Joshua that the city was to be captured after seven days, and this is how they took possession of it: Once a day for six days the soldiers marched around the city, and marching with them were priests carrying the Ark. In front of these were other priests bearing trumpets made of ram's horns. On the seventh day they marched around the city seven times, but the last time the priests blew a loud blast on their trumpets and the people uttered a great shout, and at the sound the walls of Jericho fell down. Then the Israelites entered and took possession, but not one person was harmed in the house which had the scarlet thread in the window. Thus, after many years of hardship, the Children of Israel established themselves in the land which God had promised to the descendants of Abraham, hundreds of years before. And in the course of time God raised up men to rule over them who were called judges.

RUTH AND NAOMI

A Story of Loyalty

In the days when Israel was ruled by judges there lived in the city of Bethlehem a man named Elimelech. During a period of famine he and his wife, Naomi, and their two sons departed from their home and journeyed eastward to the land of Moab, beyond the Jordan River and the Dead Sea. After they had settled in their new home Elimelech died, but his two sons married women of the land of Moab, and they and Naomi remained in the country for about ten years. Then trouble came, for both of the sons died. In her loneliness and grief Naomi turned her thoughts to her old home, where there was again food in abundance. So one day she and her two daughters-in-law Orpah and Ruth, started for Bethlehem. Before they had passed over the border of Moab, however, Naomi suggested to her companions that they turn back. She pictured to them the loneliness awaiting them in a strange country, and urged them to return before it was too late. As they talked and wept together Orpah decided to return to her people, but Ruth could not be persuaded to desert her old mother-in-law. In an-

swer to Naomi's words she said, "Entreat me not to leave thee, or to return from following after thee: for whither thou goest I will go; and where thou lodgest, I will lodge: thy people shall be my people, and thy God my God."

So Naomi and Ruth journeyed on together and came finally to the home in

RUTH AND NAOMI

Bethlehem. There was much excitement among the neighbors when they saw Naomi, but when they questioned her she told them not to call her Naomi, but Mara, which means bitter. She meant that the Lord had dealt very bitterly with her, for she had lost her husband and her two sons. It was truly a sad homecoming. In those days it was the custom for the poor to go into the harvest fields and pick up the grain which the reapers left behind them. When Naomi and Ruth arrived at Bethlehem it was just at the time of the barley harvest, and Ruth suggested that she go into the fields to glean, that they might have food to eat. Naomi gave her consent, and it happened that Ruth gleaned in the field owned by a rich kinsman of Elimelech, a man by the name of Boaz. When, as was his custom, he came into the field to watch his reapers, he noticed the strange young woman, and inquired who she was. The chief servant related her story, and Boaz was deeply moved by her loyalty to the lonely mother-in-law. He spoke very kindly to her, telling her to continue to glean in his field, and promising that no harm should come to her. At meal time they sat side by side, and Boaz gave her parched corn to eat. When she returned to her work he told his reapers to let some handfuls of grain fall on purpose for her.

Naomi was made very happy that evening when Ruth came home with a goodly supply of grain, and described the great kindness of Boaz. She told her daughter that their benefactor was one of their kindred, and that she must do all that he said. So Ruth returned to the field of Boaz and gleaned there until the end of the harvest. When the harvest was over Boaz asked her to be his wife, and a happy marriage was the reward of her faithfulness. In time a little son was born to her. In this new life none was happier than Noami, especially when she became the nurse of the baby boy, whom they called Obed. It is interesting to know that years later Obed became the father of Jesse, whose son David was one of Israel's kings.

THE STORY OF SAMUEL

A Boy Who Was Obedient

When Eli was the high priest at the tabernacle in Shiloh, he noticed one day that a woman, who was much troubled, came to the place to pray. She wept as she prayed, but she spoke so softly he could not understand her. At first he thought she had been drinking too much wine and he rebuked her, but when she told him that she was sorrowing because of a blessing denied her, he told her to go in peace, and assured her that God would answer her prayer. Then she returned to her home in Ramah, greatly comforted. This woman's name was Hannah. She was the wife of a good man named Elkanah, and she was grieving because she had no children. When she

prayed in the tabernacle she made a vow that if a son came to her she would consecrate him to the service of the Lord. In the course of time her prayer was answered, and a baby boy was born to her, whom she named Samuel. As soon as he was old enough Hannah and Elkanah brought the child to the tabernacle and showed him to Eli. "I am the woman that prayed here," she said, "and this child is the blessing I asked for. Therefore I have given him back to the Lord, and he shall belong to the Lord as long as he lives." So she left him there and every year she visited him and brought him a new coat.

Little Samuel was very happy in his life at the tabernacle, and he became a great help and comfort to Eli, who was growing old. Eli had two sons who were priests in the tabernacle, but they were not good men, like their father, and their evil ways kept people from the house of worship. Eli rebuked them, but he did not take any steps to punish them, nor did he put good priests in their place. One night after Samuel had gone to bed he heard a voice calling, "Samuel." At once he answered, "Here am I," and ran to Eli to see what he wanted. But Eli said, "I did not call. Lie down again." Again the boy heard a voice calling him, and once more ran to Eli. But the high priest answered as before, "I called not, my son; lie down again." A third time Samuel heard the voice, and again he ran to Eli, saying, "Here am I, for thou didst call me." Then Eli knew that it was the voice of the Lord speaking to the child. So he said to him, "Go, lie down; and if He call thee, say, 'Speak, Lord, for Thy servant heareth.'"

Samuel returned to his bed, and when he heard the voice he cried out, "Speak, for Thy servant heareth." Then there was revealed to him something that must have made him feel very sad. He was told that the Lord was going to do a thing which would make everyone who should hear of it afraid; that he would punish Eli and his sons, because the sons were wicked and their father had not kept them from their evil ways. In the morning Samuel rose up and opened the doors of the tabernacle, as was his custom, but he dreaded to meet Eli and disclose what he had heard. The high priest, however, called him at once, and said, "Samuel, my son, what is the thing that the Lord hath said unto thee? I pray thee hide it not from me." Then Samuel told him every word, keeping nothing back. Eli realized that he deserved God's displeasure, and he said, "It is the Lord! let Him do what seemeth Him good."

Some time after this the Israelites were defeated in a great battle with their bitter enemies, the Philistines. When the soldiers came back to their camp, the chief men began to ask why this disaster had come upon them. Then they decided to have the precious Ark of the Covenant, which contained the Tables of the Law, brought to the camp from the tabernacle at Shiloh. "For," they said, "when it is among us it may save us from our enemies." Now, this was a wrong thing to do, because they did not wait for guidance from God in the matter. They sent to Shiloh for the Ark at once, and it was carried to the camp by the sons of Eli. When the people saw it they shouted for joy, so that the Philistines heard the noise in their own camp, and asked the reason for the uproar. The news that their enemy had taken the holy Ark into the camp did not discourage the Philistines, however, and that day they defeated the Israelites in another great battle and took from them the Ark. Among those slain in the battle were the sons of Eli.

When the battle was over a messenger ran from the camp of Israel to Shiloh, to carry to the people the terrible news; as was customary in those days, he showed his grief by tearing his garments and putting earth on his head. Now as Eli was sitting upon a seat by the wayside, waiting for news of the Ark, he heard a great tumult in the city. This was the cry of despair that went up from the people when the messenger told them that the battle was lost and the Ark captured. Then as Eli turned his sightless eyes toward the city, the man came running

up and broke the news to him. The aged priest could bear to hear tidings of the defeat of the army and the death of his sons, but when he learned of the fate of the Ark he fell from his seat and was killed. Thus was fulfilled the prophecy that Samuel had heard in the night.

Samuel, all this time, had been growing and increasing in knowledge and goodness, and when Eli died he became judge over all the people. The Ark was restored to the Israelites after seven months, but was not brought back to the tabernacle at Shiloh. Samuel returned to Ramah, his birthplace, and made that his home, and he built an altar there and offered up sacrifices. He was the last of the judges of Israel, for in his old age the people demanded that their next ruler should bear the title of king. And Samuel later anointed Saul to be the first king of Israel.

DAVID AND JONATHAN

A Story of Friendship

The story of David and Jonathan belongs to that period when the Israelites had come under the rule of a king. David was the youngest son of Jesse, a rich sheep owner of Bethlehem, and Jonathan was the son and heir of Saul, the king of Israel. When we first hear of David he was a strong, manly lad of about sixteen, with reddish hair and a countenance "very goodly to look upon." One day, while he was engaged in his daily task of guarding his father's flocks, he was visited by messengers of King Saul. Now, the king at times would fall into moods of deep melancholy, and he had asked his servants to find someone who would drive away his brooding by playing upon the harp. One of the attendants said that he knew of a skilled harpist, and the king sent his messengers to bid him come to court. This harpist was none other than the boy shepherd of Bethlehem, and so it came to pass that he found himself in the court of a king. Saul was delighted with the comely lad, and he received refreshment and healing in listening to his playing.

Not long after David was brought to court the Israelites were threatened by a neighboring people, the Philistines. Saul gathered together an army to fight them, but his youthful harpist returned home to take up again his duties as tender of his father's sheep. Three of David's brothers entered the army of Israel, and one day Jesse, their father, sent his youngest son to the camp with food for them. He found the Israelites sorely terrified by a great champion of the Philistines—a giant named Goliath—who daily strutted before the soldiers of Saul and dared them to send a champion against him. Not one of the king's warriors had the

DAVID PLAYING BEFORE SAUL

courage to accept his challenge, and it was therefore with amazement that Saul heard David asking that he himself be permitted to fight the giant. "Thou art but a youth," said the king. But David persisted, and, refusing to put on the helmet and coat of mail that Saul offered him, he went out to battle armed with a sling and five smooth pebbles. Eagerly he ran forward to meet the Philistine, who scoffed at him and ridiculed his ap-

pearance, but the first stone hurled from his sling smote the giant in the forehead and killed him. And when the Philistines saw that their champion was dead they fled in dismay.

Of course this astonishing deed made David a great hero. He was brought again before the king, and we can imagine the wonder in Saul's voice as he questioned this mild-faced lad whom he knew only as a gentle harpist. David's modest bearing and his simple reply to Saul's question as to who he was, "I am the son of thy servant Jesse, the Bethlehemite," deeply impressed one person who listened to the conversation. This was Jonathan, the king's son. When the interview was over "Jonathan's soul was knit with the soul of David, and he loved him as his own soul." Then there began a beautiful friendship between the young men. And as was the custom in those days, Jonathan gave to David his royal robe, his sword, his girdle and his bow. Saul then made David one of his generals.

The story of Jonathan's loyalty to his friend is one we all love to think about. The young prince was everything that a king's son should be—strong, brave, handsome and generous. He was true to David at the price of arousing his father's bitter anger, for as time passed by Saul grew very jealous of David, and his ill-will increased until he determined to kill him. At last David was forced to flee for his life. One day he met Jonathan in a secret place, and the two talked together long and earnestly. Jonathan had tried to bring about a reconciliation and to pacify his father, but David could not believe the king had given up his evil plans. "I will absent myself from the king's table at the feast of the new moon," he said, "and when he asks about me tell him that I have gone to Bethlehem to attend a sacrifice. Thou wilt know from his manner of receiving this news whether my life is still in danger." Then the friends agreed that at the end of three days David should conceal himself by the stone of Ezel, and that Jonathan should go into the field and shoot three arrows. Then he would send a lad to find the arrows and would say to the boy, "Behold, the arrows are on this side of thee," or "Behold, the arrows are beyond thee." If David heard the words *beyond thee* he was to know that the king still sought to kill him.

On the day following the new moon Saul inquired of Jonathan where David was. When he heard Jonathan's reply he turned on his son savagely, warning him that so long as David was alive their right to the throne was in peril. In shame and sorrow the young man left his father, and on the morning of the next day he went to keep his appointment with his friend. To him, simple faith was more precious than a royal throne. And when David saw the arrows fall and heard the words which had been agreed upon, he knew that his life was still in danger, and, creeping from his hiding place, he fell on his face before his friend. Then the two young men wept and bade each other a tender farewell.

One other meeting is recorded. This took place sometime later, on a wooded hill about three miles south of Hebron, where David had intrenched himself with a small army of devoted followers. Though Saul's army had almost surrounded the hill, Jonathan succeeded in reaching his friend, and in giving him sorely needed words of comfort. He told him to have no fear, that Saul would not succeed in his plots, and that the next king of Israel would be named David, and not Jonathan. This was the last time the friends saw each other. Jonathan, loyal to Israel to the last, fell in battle on the field of Gilboa, in a fight against the Philistines. And when David heard of his death he uttered this beautiful lament:

The beauty of Israel is slain upon thy high places; how are the mighty fallen!

"How are the mighty fallen in the midst of the battle. O Jonathan, thou wast slain in thine high places.

"I am distressed for thee, my brother Jonathan. Very pleasant hast thou been unto me: thy love to me was wonderful, passing the love of women.

How are the mighty fallen, and the weapons of war perished.

STORIES OF THE PROPHET ELIJAH

During the reign of Solomon, son of David, the Children of Israel grew dissatisfied and unhappy because they were heavily taxed and harshly treated. Therefore, when Solomon died and his son Rehoboam came to the throne, the people demanded that their new king show them greater kindness than his father had done. But Rehoboam answered them roughly and told them that whereas his father had chastised them with whips, he would chastise them with scorpions. By this he meant that he would add to their burdens and outdo his father in cruelty. Thus it came to pass that a part of the Children of Israel rebelled, and ten of the tribes set up a separate kingdom in the northern part of the country, under Jeroboam. This king did many evil things, and the kings who followed him were as wicked as he. But Ahab, seventh king of Israel, was more wicked than all the others, for he married a heathen woman, Jezebel, and openly set up in the kingdom the worship of the god Baal. He even built a temple for this idol in the city of Samaria, which was the capital of the ten tribes.

Then God raised up the prophet Elijah to rebuke the king and to teach the people how to live righteously. One day Elijah went before Ahab and said, "As the Lord God of Israel liveth, before whom I stand, there shall not be dew nor rain in the land of Israel until the Lord commands me to ask for it." These words made the king very angry, and it was revealed to Elijah that he should flee away where Ahab could not find him. "Go," the Lord said, "and hide thyself by the brook Cherith, which flows into the Jordan. Thou shalt drink of the water of the brook, and I have commanded the ravens to feed thee there." So Elijah did as he was told, and he stayed by the brook for some time. Every morning and every evening the ravens brought him meat and bread to eat, and he drank every day from the water in the brook.

Now all this time there was no rain in the land, as Elijah had foretold, and before very long the water in the brook dried up. Then the Lord commanded Elijah to go to a city called Zarephath; in that place, he was told, a woman who was a widow would feed him. When the prophet arrived at the gate of the city he saw the woman gathering sticks, and he said to her, "Give me, I pray thee, a little water to drink." As she was about to go for the water he added, "Bring me, too, a piece of bread to eat." Then the woman told him that she was very poor, and had nothing in the house but a handful of meal in a barrel and a little oil in a cruse, or flask. "I am gathering sticks now," she said, "that I may go home and bake a cake for me and my son. After that we must starve to death." But Elijah told her to have no fears, for after she had baked a cake for him and one for herself and son, there would still be meal in the barrel and oil in the cruse. The woman did as he told her, and it came to pass that as long as the famine lasted the meal in the barrel and the oil in the cruse became no less.

After there had been more than three years of famine, it was revealed to Elijah that he was to go to King Ahab and tell him that rain would be sent again to the suffering land. On his way home he met the king's chief servant, Obadiah, who was wandering about in search of pasturage for the horses and mules that were still alive. And he told Obadiah to go to King Ahab and say that Elijah had come. When the king and prophet met Ahab rebuked Elijah for troubling the people of Israel, but Elijah told him that the famine was sent as a punishment because of their worship of Baal. Then Elijah proposed a test to show which was the true God, whether it was Baal or the God whom the prophet worshiped. And he told Ahab to have all the people gather at Mount Carmel and to bring there the four hundred and fifty prophets of Baal. When they had all gathered at the mountain Elijah called out to the people, "How long will ye be in deciding whom ye will serve?" But the people answered not a word.

After this he had the prophets of Baal kill a bullock and lay it on an altar, and

they placed wood on the altar ready for burning. But they were not permitted to put any fire under it. Instead, Elijah told them to pray to Baal to send down fire from heaven to consume the offering. Then the prophets cried out to their idol from morning until noon, but no fire came down from heaven to burn up their offering. And Elijah mocked them, saying, "Call louder upon your god; he may be talking to someone, or perhaps he is asleep and must be wakened." But though they called out until evening, there came no answer.

Then Elijah told the people to come close to him. And he took twelve stones and built up the altar of the Lord which had been broken down, and he dug a trench around it. Then he laid wood on the altar and made a bullock ready for the sacrifice, and he had the people pour barrels of water over the sacrifice until it ran down and filled the trench. It was now evening, and just at the hour when the priests were accustomed to offer up a lamb in the temple. Elijah prayed to God, asking that the people might be shown who was the true God. Then fire fell down from heaven upon the altar. It burned up the bullock and the wood, and even the stones of which the altar was made, and it licked up the water in the trench.

When the people saw this wonder they bowed down on the ground and cried, "Thy Lord, he is God."

THE HEALING OF THE SYRIAN CAPTAIN

After Elijah's work was finished Elisha prophesied in his place. In those days the Syrians invaded Israel and carried away into captivity a little girl who was made a servant of the wife of Naaman. Now Naaman was the captain of the Syrian army, and he was greatly honored by the king for his bravery. Yet he had one trouble that kept him from enjoying all this honor: he suffered from the terrible disease of leprosy. The little captive maid in his household knew about his trouble, and one day she said to her mistress, "If my master will go to see the prophet that lives in Samaria, he will cure him of his leprosy." When the king heard of this he said to Naaman, "Thou shalt go to Samaria, and I will give thee a letter to the king of Israel who lives there."

Soon afterwards Naaman departed with money and costly garments, which he intended to give to the man who cured him. On arriving at Samaria he proceeded to the palace of Jehoram, king of Israel, and delivered to him the letter written by the king of Syria. And when Jehoram read the words—"I have sent Naaman, my servant, to thee, that thou mayest cure him of his leprosy"—he was greatly troubled. For he knew of no cure of leprosy, and he feared that the king of Syria was seeking an excuse to quarrel with him. This matter was reported to Elisha, the prophet, and he sent word to Jehoram to have no fear. "Let the man come now to me," ran his message, "and he shall know that there is indeed a prophet in Israel."

Then Naaman went to the house of Elisha and stood before the door. And the prophet sent out a messenger who said, "Go, wash seven times in the River Jordan, and thou shalt be made well." This message greatly vexed Naaman, for he had expected that the prophet would come out and pray for him, and put his hand on him. Said he, "Are not the rivers in my own country better than all the rivers in the land of Israel? Could I not wash in them and be cured?" As he was departing in anger his servants came up to him and said, "Master, if the prophet had told thee to do some great thing wouldst thou not have done it? Is it not better to do as he bids thee when thou hast only to wash in the river?"

Then Naaman, heeding the counsel of his servants, dipped himself seven times in the Jordan River, and the dreadful disease left him and his skin became as rosy and clean as that of a child. Then he and all his company returned to the house of Elisha, and Naaman said to the prophet, "Now I know there is no other God in all

the earth but the God of Israel." He offered Elisha gifts of raiment and money, but Elisha could not be persuaded to accept anything, for he wished God to have all the glory for the healing of the leprosy. And this is how a great captain of the Syrians was brought to acknowledge the God of Israel through the words of a little captive maid, who was guided by the impulse to be kind.

STORIES OF DANIEL

Loyalty to Principle

When Nebuchadnezzar reigned as king of Babylon he captured the city of Jerusalem and carried away into captivity large numbers of Jews. While he was in Jerusalem this king commanded his chief officer to select a number of captive youths, who were to be given special instruction for three years and be trained for service in the royal palace. None should be chosen, the king ordered, who had any faults, but only such as were young and attractive, and quick to learn. Among those selected was a boy named Daniel. He had been carefully trained in the religion of his forefathers, and when he was brought to Babylon he resolved that he would not forget his early teachings.

Now King Nebuchadnezzar had ordered that the captive children should be given meat to eat and wine to drink from his own table, for he wished to have them well nourished. The people of Babylon, who were called Chaldeans, worshiped idols and offered up sacrifices of animals and made offerings of wine to them, and they ate the flesh of animals and drank the wine. So Daniel decided that it would be a sinful thing for him to eat meat and drink wine used for such purposes, and he asked the chief officer to excuse him and three special companions of his from partaking of that food. The officer was fond of the lad, but he dared not disobey the king, for he knew he would be very angry if the young captives should appear pale and thin. So the youths were given over to the care of the steward, who had orders to serve them meat and wine.

Then Daniel said to the steward, "Try us, I pray thee, ten days, and give us only vegetables to eat and water to drink. At the end of that time compare our faces with those of the young people who have eaten of the king's food, and if we do not look as well as they, then give us whatsoever thou thinkest best." The steward consented to make this test, and at the end of the ten days their faces were fatter and their skin clearer than the faces and skin of those who had eaten meat and drunk wine. So Daniel and his three friends continued to eat vegetable food and to drink water, and when, at the end of three years, they came before the king, they were found superior to all the other captives, both in looks and in knowledge and understanding.

The Interpretation of the King's Dream

One night Nebuchadnezzar had a dream that troubled him greatly. When he awoke he could not remember it, and so he called his wise men together and told them that they must not only recall the dream to his mind, but explain what it meant. The wise men protested that no man on earth could bring back a forgotten dream, but they said they would interpret the dream if the king would tell it to them. Then Nebuchadnezzar grew very angry and ordered all the wise men of Babylon to be killed. Now, Daniel was reckoned as one of the wise men, and when the news of the decree was brought to him he went into the palace and entreated the king to give him more time. He promised Nebuchadnezzar that he would reveal the meaning of the dream, and the king promised to give him the time he asked for.

Now this was the dream that Daniel recalled for Nebuchadnezzar. He said: "Thou sawest in thy dream, O king, a great image. The form of it was terrible, and it shone with exceeding brightness as it stood before thee. Its head was made of fine gold, its breast and arms were of silver, the rest of its body was of brass; its legs were of iron, and its feet were part

of iron and part of clay. As thou beheld it there came a stone cut out of a mountain, that struck the image upon its feet and broke them to pieces. Then the image fell, and the iron, the brass, the silver, the gold and the clay were all broken up together by the stone, into pieces as small as the dust which is left on the threshing floor after the farmer has been threshing his grain; and the wind blew them away, no one could tell where. Afterward the stone that had broken the image grew to be a great mountain and filled all the earth."

Then Daniel told the king that his dream was a warning of things to come. The gold, the silver, the brass, the iron and the clay, he said, all meant different kingdoms. The head of gold meant Nebuchadnezzar himself, because he was greater than all the other kings. After he died, new kingdoms would arise, and these were typified by the silver, the brass, the iron and the clay. Last of all the Lord would set up a kingdom which never would be destroyed, but which would break in pieces all the kingdoms that were before it, just as the stone had broken the image. This stone typified the kingdom of Christ. When Daniel finished speaking the king fell on his face before him and acknowledged the power of the true God. And afterwards he made Daniel ruler over the province of Babylon and chief of all his wise men.

The Handwriting on the Wall

After many years Nebuchadnezzar died, and his son Belshazzar reigned in Babylon. One night Belshazzar gave a royal banquet for a thousand of his lords. They drank wine out of gold and silver vessels which had been taken out of the temple in Jerusalem, and they feasted and joined in noisy revelry. While they were making merry there suddenly appeared on the wall of the banquet room a man's hand, which wrote words in a language no one understood. As the king watched the mysterious hand he grew pale with fear, and he trembled until his knees knocked against each other. Then he cried aloud to his servants, bidding them bring in his wise men. To them he said, "Whoever shall read this writing and interpret it shall be clothed in scarlet and have a chain of gold about his neck, and shall be the third ruler in the kingdom." But not one of the wise men could read the mysterious writing.

This matter was made known to the queen, and she came in before the king and said, "Be not troubled, O King. There is a man in the kingdom who has the wisdom and understanding of the gods, and was made chief of all the wise men by thy father, Nebuchadnezzar. Let this man Daniel be called; he will give the interpretation." When Daniel was called in before the king, Belshazzar said to him, "Art thou that Daniel who was brought captive with the Children of Israel, out of Judah? I have heard of thy wisdom and understanding, and am told that thou canst interpret secret things. Read and interpret this writing for me and thou shalt be clothed in scarlet and have a chain of gold about thy neck." But Daniel answered, "Keep thy gifts for thyself and give thy rewards to another. I will read and interpret the writing for the king."

Then he reminded Belshazzar of the pomp and glory that had been Nebuchadnezzar's and recalled how he had forgotten the true God and lost all his kingly glory. And he continued, "Thou, his son, hast not humbled thine heart, but hast been proud and sinful. Behold the golden vessels of the temple of God, which thou and thy lords have filled with wine. Because thou hast done these things and hast honored idols of wood and stone, God hath sent this writing, and these are the words of it: Mene, Mene, Tekel, Upharsin. And the interpretation is—God hath numbered thy kingdom and finished it. Thou art weighed in the balances and art found wanting. Thy kingdom is given to the Medes and Persians." When Daniel had finished speaking the king ordered him to be clothed in scarlet, and he made a decree that he should be the third ruler in the kingdom. But that same night Babylon was stormed by the Medes and Persians and Belshazzar was

slain. Then the kingdom was taken over by Darius, the Mede.

In the Lion's Den

After Darius became king he chose one hundred and twenty princes to govern the kingdom. Over these he set three presidents, and he made Daniel the chief of the presidents because he trusted and admired him. But the other presidents and the ruling princes grew jealous of Daniel because of the greater honor given him, and they plotted against him. When they found that they could bring the king no evil report of him, they remembered that he worshiped the God of the Jews, and they decided to use this against him. So they said to the king, "King Darius, live forever. All the chief men of thy kingdom have consulted together, and want a law made that whosoever asks help of any god or man, for thirty days, other than of thee, O king, shall be cast into a den of lions. Now, O king put this law

THE LIONS' MOUTHS WERE CLOSED

into writing and sign it, so that it cannot be changed; for the laws of the Medes and Persians never change." Seeing then no objection to the decree, Darius had the law written, and he signed it.

Now it was Daniel's custom to kneel in prayer in his own room three times a day. He always prayed with the windows opened toward Jerusalem, and so this habit was known to everybody. When he heard of the decree he went as usual to his room, and prayed openly, as was his custom. No sooner did his enemies see him in this act than they hastened to the king and reminded him of the decree he had signed. But when they told him that Daniel had disregarded the law by praying to his own God, Darius was very much displeased with himself for having signed such a law. He labored all the rest of the day, till sundown, to find a way to deliver his trusted servant, but it was not possible even for a king to change a law of the Medes and Persians.

Then at last he gave the order to have his servant cast into the den of lions, but as Daniel was led away the king said to him, "Thy God, whom thou servest continually, he will deliver thee." Then Darius returned sorrowfully to his palace and spent the night in fasting. Early in the morning he hastened to the den of lions and called out fearfully, "O Daniel, thou servant of the living God, is thy God able to deliver thee from the lions?" And to his great joy he heard a voice saying, "O king, live forever. My God has sent his angel and shut the lions' mouths so that they have not harmed me. For I have not sinned against my God, nor have I done wrong to thee, O king." Then the happy king ordered the captive released, and they found him unhurt. After this Darius made a new decree that men in every part of the kingdom should honor the God of Daniel. And Daniel prospered in the reign of Darius, and in the reign of Cyrus, who followed him.

It is recorded of Cyrus that he, too, was pleased with Daniel, and not only treated him liberally, but all the Hebrews who were in captivity. In the first year of his reign he issued a proclamation providing for the return of the people to Jerusalem to rebuild their Temple. Cyrus also restored to the Hebrews the beautiful gold and silver vessels which years before King Nebuchadnezzar had wrongfully taken from the Temple.

ESTHER, THE BEAUTIFUL QUEEN

In the third year of his reign, Ahasuerus, king of Persia, gave a magnificent feast for his nobles and attendants, in the garden of the royal palace of Shushan. At the same time the king's wife, Vashti, gave her friends a feast, in the women's part of the palace. On the seventh day, when the king had drunk much wine and was feeling merry, he ordered his queen to appear before his guests, that they might see how beautiful she was. But Vashti did not care to display her beauty in this manner, and she refused to obey his husband.

Ahasuerus was very angry, and he said to his wise men. "What shall we do to Queen Vashti, because she has not obeyed the commandment of the king?" One of the wise men answered, "Vashti has wronged not only the king but all the princes and all the people in the kingdom; for if the women hear that the queen refuses to obey the king, they will no longer obey their husbands. Therefore, O king, make a decree that Vashti shall come no more before thee, and let this decree be known to all the people, that the wives throughout the land may know that they must obey their husbands." This advice pleased the king very much, and he had the decree published throughout the length and breadth of the land. Then the royal servants came to their master, saying, "Let the king send officers to all the provinces of the kingdom, that they may gather together all the beautiful young women of Persia into the palace at Shushan. And let the one who pleases the king best be queen instead of Vashti." This advice, too, pleased the king, and he ordered the thing done.

Among the servants in the palace there was a Jew by the name of Mordecai. He belonged to the tribe of Benjamin, and had been carried away into captivity from Jerusalem, many years before. This good man had brought up as his own child an orphan girl named Esther, the daughter of one of his uncles. At the time of our story Esther was a young woman, and she was as good as she was beautiful. In accordance with the king's commandment young maidens were brought to the palace and Esther was among them. Her beauty was noticed by the king's officer, and he treated her very kindly, giving her maids to wait on her, and placing her in the best part of the palace. And until it was time for Esther to go before the king, Mordecai walked every day before the court of the women's quarters, to find out how his beautiful cousin was faring. At last she was brought before the king. As soon as Ahasuerus saw her he knew that he loved her, and he set the royal crown upon her head, and made her his queen in place of Vashti.

Soon after Esther became queen two of the king's officers plotted to kill the king. Mordecai, who was a watchman at the palace gate, overheard what they said, and told Esther. She warned the king, and so saved his life. And what Mordecai had done was written down in a book.

Among the servants in the palace was a man named Haman. He won the favor of King Ahasuerus, and was exalted above all the noblemen and attendants at the court. The king's servants who watched at the gate were commanded to bow down to Haman, and everyone obeyed this order except Mordecai. When the other servants told Haman of Mordecai's defiance he formed a plot to kill all the Jews in the kingdom, for the servants reported that Mordecai was one of that race. First he tried to poison the king's mind by speaking ill of the Jews. He said that they had laws of their own, and would not obey the laws of Persia. The king listened to what Haman said, and gave him a ring which he used in sealing his writing whenever he made a decree. By this he meant that Haman could issue a decree against the Jews and could seal it with the ring; in this way it would have the king's sanction. Haman therefore had a decree written that on the thirteenth day of the twelfth month the people of Persia should kill all the Jews in the kingdom, from the oldest to the youngest. This cruel decree was

sealed with the king's ring, and copies of it were sent by messengers to the rulers of all the provinces in Persia.

As soon as Mordecai heard the dreadful news he rent his clothes and put on sackcloth, which was a token of bitter sorrow. And all through the land there was mourning among the Jews, and fasting and crying. Queen Esther knew nothing of the decree, but her maids told her that Mordecai was mourning bitterly and had put on sackcloth, and she sent one of the servants to find why he sorrowed. Mordecai told the servant all that had taken place, and he gave him a copy of the decree to show to Esther. He begged him also to ask the queen to intercede for the Jews before the king.

Then Esther, when she received the message, sent the servant back to Mordecai with this reply: "Whoever goes into the inner court of the king without being called is liable to be put to death. Such a one is saved only when the king holds out his golden sceptre. I have not been called to come in unto the king for thirty days." But Mordecai returned this answer: "Think not that thou shalt escape any more than the other Jews. For if thou wilt not try to save thy people at this time, some one else will save them, but thou and thy relations shalt be destroyed. Who knows but that thou hast been made queen for the express purpose of delivering thy people?" Then Esther hesitated no longer, but sent word to Mordecai to gather the Jews in the city together, and have them fast for three days. "I and my maidens also will fast," she said, "and then will I go unto the king. And if I perish, I perish."

At the end of three days Esther dressed herself in royal robes and went into the inner court and stood where the king, seated on his throne, could see her. When he looked at her he felt kindly towards her, and held out the golden sceptre. So she drew near and touched the top of the sceptre. Then the king said, "What is it thou desirest, Queen Esther? It shall be given thee even unto half of my kingdom." She answered, "If the king be willing I want the king and Haman to come to-day to a banquet which I have made ready." Then Ahasuerus at once sent word to Haman to make haste to come to the queen's banquet. When they were at the table the king asked Esther what thing she desired of him, for he knew that she had a wish still unuttered. But she answered, "My desire is that the king and Haman come to another banquet to-morrow. Then I will tell the king what it is I would ask of him."

As Haman left the banquet room he felt very proud and happy to be so honored, but when he saw Mordecai, as he passed through the palace gate, he burned with indignation. For the Jew gave no sign that he saw him. At home that day he boasted to his wife and friends of his riches and honors. Yet he told them that even an invitation to the queen's banquet did not console him when he remembered the Jew sitting at the gate. So his wife and friends said, "Let a gallows be made fifty cubits high, and to-morrow ask the king to have Mordecai hanged upon it." This idea pleased Haman very much, and he ordered the gallows to be built at once.

That night the king was restless and could not sleep, and he had his servants read to him out of the book of records. When they came to the part which described the loyalty of Mordecai in reporting the plot to kill the king, Ahasuerus said, "What honor has been done to Mordecai, because he did this service for me?" They answered, "Nothing has been done for him." While they were thus talking together, Haman came into the outer court. He was on his way to ask the king that Mordecai be hanged upon the gallows he had ordered built. When the servants told Ahasuerus that Haman waited outside to speak to him, he said, "Let him come in." As Haman stood before him, the king said, "What shall be done for the man whom the king desires greatly to honor?"

Then the boastful Haman thought to himself, "I am the man whom the king wishes to honor." But aloud he said, "Let the royal robes that the king wears, and the horse that he rides, and the crown

that is set on his head be brought to the man that the king loves to honor. Let him wear the robes and the crown, and let him ride upon the king's horse. And let one of the king's most noble princes lead the horse through the streets of the city, and cry out to all the people, 'Thus shall it be done to the man whom the king delighteth to honor!' "

ESTHER BEFORE THE KING

When the king heard these words he said to Haman, "Make haste and take the robes and the horse and the crown, and do to Mordecai, the Jew, as thou hast said; leave nothing that thou has spoken undone." Though he was almost overcome with humiliation and disappointment by this command, Haman did not dare disobey his master, and he carried out his orders completely. But after he had led Mordecai's horse through the streets of the city he hastened home bowed down with shame and with his face covered. While he was telling his wife and friends what had taken place, a messenger came to bring him to the queen's banquet.

When they were at the table the king said, as before, "What is thy petition, Queen Esther? For it shall be given thee, even unto half of my kingdom." Esther replied, "If the king be pleased with me this is my request, that the king will save my life, and save my people from destruction. For an enemy hath spoken against us, and we are to be slain." "Who is the man that hath dared to do these things?" cried the king. And Esther answered, "Our enemy is this wicked Haman." Then the king arose in great anger and hastened into the palace garden, but the frightened Haman bowed before the queen and begged her to save him. When the king returned to the banquet room one of his servants said, "A gallows fifty cubits high is ready by the house of Haman; he had it built for Mordecai, who saved the king's life." And Ahasuerus said, "Hang Haman upon it." So the wicked man died.

Then Esther told the king who Mordecai was, and of their kinship, and the king sent for him and gave him the ring with the seal. Haman's house had been presented to Esther, and she made Mordecai ruler over it. But the queen was still troubled, for the decree that the Jews must perish had not been recalled. Therefore she again presented herself before the king and again he held out to her the royal sceptre. Then she begged that the decree of Haman might be changed so that her people should not perish. In Persia in those times a law once published could not be changed, and Ahasuerus himself was unable to revoke the cruel decree. But he told Esther and Mordecai that they might issue a new decree giving the Jews the right to defend themselves. And it came to pass that on the thirteenth day of the twelfth month the Jews took their swords and defeated all who sought to kill them.

Thereafter two days of the twelfth month were observed by the Jews throughout the kingdom, as a memorial of the deliverance of the people. This month, they said, was the one in which their sorrow was turned to joy, and their mourning to gladness. All of these events were written down in the history of the kings of Media and Persia. For many years Mordecai was second only to King Ahasuerus, and held the highest place among the Jews.

BIBLIOGRAPHY, *bib li og'ra fi.* As most generally used, this term is used to describe a work which deals with the contents of books. In a wider sense it denotes writings about books in reference to the subjects discussed in them, their different degrees of rarity, reputed and real value, the materials of which they are composed and the rank which they ought to hold in the classification of a library. The subject is sometimes divided into *general, national* and *special* bibliography, according as it deals with books in general, with those of a particular country or with those on special subjects or of a special character, as early printed books or anonymous books. A general bibliography of all books that have ever been published is the unrealized dream of many scholars.

BIBLIOMA'NIA, a passion for collecting rare and curious books. Bibliomania has manifested itself to a remarkable extent during the last hundred years. With the bibliomaniac, or more properly *bibliophile,* the utility of a book is of secondary importance, while its rarity is the first, and sometimes only, requisite. First copies of books, scarce editions, the first publications of authors afterwards famous, and *editions de luxe* are among the treasures sought by the bibliophile. Books of the early printers, especially the Gutenberg, Caxton, Aldine and Elzevir books, bring enormous prices. A Bible, supposed to date from the year 1450, and to be one of the oldest printed books in existence, sold in 1911 for $50,000. There are in different countries a number of clubs of booklovers.

BIBLIOTHEQUE NATIONALE, *be ble o tek' nas yo nal',* the French national library in Paris, the largest library on the continent. It contains over 2,600,000 printed volumes and maps, about 102,000 manuscripts, more than 250,000 engravings and 150,000 coins and cameos. The fact that there are so many printed volumes is due to the decree of 1536, that one copy of every book printed in France shall be deposited in the national library.

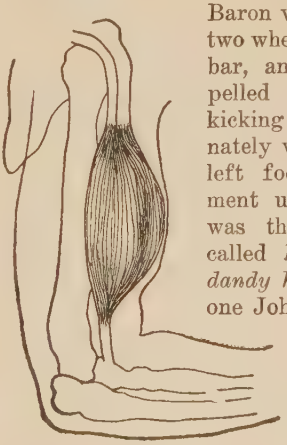
BICEPS, *bi'seps,* the large muscle in front of the arm, attached at its upper extremity to the scapula and at its lower, by a tendon, to the rădius. By its action the elbow is bent, or if the elbow be made a fixed point the shoulder is moved, as may be seen in climbing a pole "hand over hand." The corresponding muscle on the back of the arm is called the triceps. See MUSCLES.

BICYCLE, *bi'sick'l,* a two-wheeled vehicle which can provide rapid transportation for one, two, three or four persons. When this machine was at the height of its popularity, about the year 1898, racing bicycles seating six persons were also manufactured, but to-day only the single-seated model is made.

A bicycle may be described as a light vehicle having two wheels, one directly behind the other, attached to a frame of steel, upon which a seat is mounted. It is propelled by the rider's feet, in contact with pedals. The earliest of the modern bicycles weighed as much as 150 pounds, and sold for about $175; the best models of the present time weigh from twenty to thirty-five pounds; a good machine may be purchased for about $25.

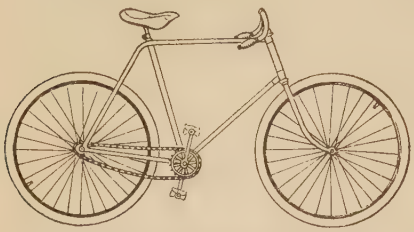
From about 1885 to 1895 millions of these machines were sold, and nearly all of them were used for pleasure. Their popularity waned suddenly; manufacturers declared this was because they ceased to advertise them, thinking the demand would continue without persuasion. The output declined nearly ninety per cent within a few years. To-day they remain popular with boys, but adults continue their use only as an aid to them in their work. Their place has largely been taken by the powerful motorcycle (which see).

The first bicycle was invented in 1816 and was known as the *draisine,* from its inventor, Baron von Drais. It had two wheels connected by a bar, and the rider propelled the machine by kicking the ground alternately with his right and left foot. An improvement upon the draisine was the *curricule,* also called *hobby horse* and *dandy horse,* invented by one Johnson of England. This was followed by the *velocipede,* which in form and principle of construction resembled quite closely the modern bicycle, but the frame and wheels were of wood, the machine was propelled by the forward wheel and in



BICEPS

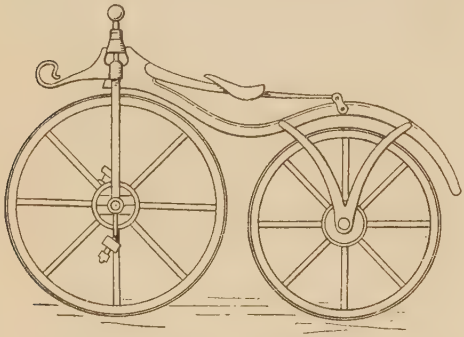
construction was somewhat clumsy. The velocipede was introduced into the United



MODERN SAFETY BICYCLE

States in 1866, and in the next three years velocipede-riding became very popular.

The velocipede gave way to the high bicycle or *ordinary,* which was introduced in 1873,



DANDY HORSE

and for about ten years was in general use in America and Europe, when it was displaced by the modern *safety bicycle.*

BIDDEFORD, *bid'e ford,* MAINE, founded as early as 1630, is a city in York County, fifteen miles southwest of Portland, on the Saco River, six miles from the ocean. The river furnishes water power for manufactures of cotton goods, lumber and shoes. There are also machine shops. The town is on the Boston & Maine Railroad. A new Federal building dates from 1914, and there are two hospitals and a library. A considerable number of the people are French. Population, 1910, 17,079; in 1917, 17,760 (Federal estimate).

BIENNIALS, *bi en'i alz,* in botany, a name given those plants which live practically for two years. The first season they sprout and bear leaves and roots, and the following spring or summer they produce flowers, seed and fruit. The intervening winter is a period of rest, in which nourishment is stored in the roots for the flowering period. Carrots, beets and turnips are good examples of biennials, the roots in each case being an important food for man. Plants that live one year are called *annuals,* and those that live from year to year for an indefinite period are *perennials.* See articles under these headings.

BIENVILLE, *byaN veel'* JEAN BAPTISTE LE MOYNE, SIEUR DE (1680–1758), a French governor of Louisiana. He accompanied his brother Iberville in his explorations of the Mississippi and helped him to settle Biloxi in 1699. In 1700 he explored the country and erected a fort fifty-four miles above the mouth of the river, and in 1701 became director of the colony and removed its capital to Mobile, but was discharged from his office in 1707. A new colony having been formed by Law's Mississippi company, Bienville was made its governor; he founded the city of New Orleans in 1718 and transferred the capital of Louisiana to the new town in 1723. He was removed from his post on August 9, 1726, but in 1733 he was again made governor of Louisiana, with the rank of lieutenant-general. He published a code which prohibited every religion except the Roman Catholic and banished Jews from the colony; this remained in force until Louisiana was purchased by the United States.

BIERSTADT, *beer'staht,* ALBERT (1830–1902), a German painter, born in Dusseldorf, Germany. He came to America when a child. Though he studied art in Europe, he chose California and Colorado as the field for his work. His favorite subjects contained mountain scenery, and he painted Laramie Peak, Lander's Peak, Mount Hood and other peaks of the Rockies and the Sierra Nevada range with great success. Bierstadt was a member of the National Academy and of the Saint Petersburg Academy of Fine Arts.

BIG'AMY, a legal term signifying the crime of marrying a second time before the first marriage is dissolved. The Roman Catholic Church does not recognize divorce as valid, and communicants of that Church are not permitted to remarry even though the first marriage is legally dissolved. The civil law, however, in nearly all countries, takes the opposite view. In the United States any one convicted of bigamy is liable to penitentiary imprisonment for a term varying from two to five years. In England and Canada the minimum penalty is

two years' imprisonment at hard labor. See POLYGAMY; DIVORCE.

BIGELOW, *big'lo,* POULTNEY (1855–), an American historian and newspaper correspondent, born in New York. After study in America, France and Germany, where he became a personal friend of the German emperor, he was graduated at Yale and at the Columbia Law School. He practiced only a few years, however, and then began to travel extensively. He sailed around the world, was shipwrecked on the coast of Japan, visited China, Africa, the East and West Indies and made canoe trips over Europe. His journalistic experience includes his work as editor of *Outing,* which he founded, as London correspondent of *Harper's Weekly* and as Spanish-American War correspondent of the London *Times.* He has written *The Border Land of Czar and Kaiser,* investigation for which led to his expulsion from the Russian Empire; *A History of the German Struggle for Liberty, White Man's Africa,* and other works.

In 1905 Bigelow was severely criticized for publishing an unfavorable article on the Panama Canal, which government officials declared was based on insufficient information. His latest publication, *Genseric, King of the Vandals and First Prussian Kaiser* (1918), is a unique treatment of the personality of former Emperor William II.

ROCKY MOUNTAIN GOAT

BIG'HORN, the wild sheep of the Rocky Mountains, named from the size of its horns, which are three and a half feet long, the animal itself being of the same height at the shoulder. It is grayish-brown, with a lighter face, and has a whitish patch on the rump and a dark line running along the spine. These animals go in herds of twenty or thirty, frequenting the craggiest and most inaccessible rocks, and are wild and untamable. The bighorn is also called the Rocky Mountain goat.

BIGHORN RIVER, a tributary of the Yellowstone, which rises in Wyoming, near Fremont's Peak, and flows northeasterly, entering the Yellowstone near Blakely, Mont. The upper part of its course is noted for the grandeur of the mountain scenery. Its length is 450 miles, and it is navigable as far as Fort Custer.

BIGLOW PAPERS, the name given by James Russell Lowell to two series of poems written by him as satires on political conditions. One series appeared in 1848, and dealt with the Mexican War; the other, which touched on the Civil War and reconstruction, was published in 1867. Both were assumed to be the work of one Hosea Biglow, who used the "Yankee" dialect and displayed the sly humor and shrewdness that is supposed to be typical of that species of American. The following quotations are representative:

I du believe in bein' this
Or thet, ez it may happen
One way or t'other hendiest is
To ketch the people nappin'.

An' you gut to git up airly
Ef you want to take in God.

BIGNO'NIA, a family of plants of many species, inhabitants of hot climates, usually climbing shrubs furnished with tendrils. The flowers are mostly in clusters at the ends of stems or in the axils of the leaves. All the species are splendid plants when in blossom, and many of them are cultivated in gardens. Representative of the family are the trumpet creeper, much cultivated as a porch vine, and the cross vine, a climbing shrub common in Southern United States.

BIG SAND'Y, or SANDY, an affluent of the Ohio River, formed by the junction of the Tug Fork and the Louisa Fork. The Tug Fork rises in West Virginia and, flowing northwest, forms, with the Big Sandy, the southern boundary between West Virginia and Kentucky. The Louisa Fork rises in southwest Virginia and flows northwest into

Kentucky, then northeast to join the Tug Fork. The river is navigable for small boats for about 100 miles.

BILBAO, *bil bah'o,* SPAIN, capital of the province of Biscay, and an important commercial city. The city lies on both banks of the River Nervion, eight miles from the Bay of Biscay, and is one of the leading ports of Spain. It is also a great railway center and is famous for the manufacture of swords, the *bilbos* of Shakespeare's plays. In the vicinity there are valuable iron mines. Population, 1910, 92,514.

BILE, a yellow, bitter liquid, separated from the blood by the cells of the liver and collected by the biliary ducts, which unite to form the hepatic duct. Bile passes from this duct into the duodenum, or by the cystic duct into the gall bladder, to be retained there till required for use. The flow of bile is continuous, but the amount varies during the twenty-four hours, being most abundant during digestion. The use of the bile is to aid in the digestion of fatty substances and to convert the chyme into chyle. It probably retards or prevents the decaying of food and may stimulate muscular action in the intestines. Jaundice is a diseased condition caused by an obstruction of the flow of bile into the intestine, and its reabsorption into the blood. When the contents of the gall bladder become infected gall stones form.

BILL, a word describing documents of widely differing character.

In legislation, a bill is a draft of a proposed law to be enacted into a statute. If adopted by majority vote, and signed by the executive, the bill then is known as an *act.* See CONGRESS OF THE UNITED STATES; PARLIAMENT, subhead *Parliament in Canada.*

In law, a bill may refer to many forms of legal documents, whose names partially explain their contents; as, a *bill of costs,* a *bill of particulars.*

In business, an itemized statement of goods sold, together with the value of each article and the total cost. The terms of sale are also stated.

In business a clerk whose duty it is to prepare invoices of goods sold to customers is called a *bill clerk;* the work is usually done on a typewriter. In government, the official who prepares bills which have become laws for the signature of the executive is known as the engrossing clerk. Original copies of such acts are filed in the archives.

BILLIARDS, a well known indoor game of skill, played on a rectangular table with ivory balls, which are driven against one another by means of an ash rod, or stick, called a *cue,* according to certain defined rules. The regulation table is four and one-half feet by nine feet in size, though smaller sizes are also made.

Rules of the Game. The game as played in America has taken a distinctive character, in regard to both the tables and the manner in which it is played. The older American game was the four-ball game (now rarely played by experts), and it was at first played on a six-pocket table, after the English pattern, then on a four-pocket table and finally on a pocketless table. The points of the game number usually thirty-four, fifty or one hundred. A point is made whenever the cue ball in a single shot touches the two object balls. At the commencement of the game, the players *bank for lead,* which is done by both simultaneously driving their balls against the bottom cushion; the ball approaching and resting nearer to the head cushion on the rebound decides the winner, both as to choice of balls and as to order of play. The table has two spots, one near each end of the table. A red ball is placed on the spot at the foot of the table, and the ball of the player who lost the bank for lead is placed on the spot near the head of the table.

The leader places his ball anywhere nearer the head of the table than his opponent's ball, and he tries to hit the red ball in such a way that his ball will strike, on its return, the ball of his opponent. If the leader succeeds, he has made a point, or *carom,* and he continues to play his ball at either of the others until he misses. Then his opponent plays his own ball, from where it lies, at either ball, under the same rules and conditions, until he misses a point. In this way the players alternate till the end of the game. If a ball jumps off the table after counting, the count is good and the ball must be placed on the spot at the foot of the table. When the cue ball is in contact with another, the balls are respotted and the player plays his own ball as at the commencement of the game.

Variations in the Game. The cushion carom game is a highly scientific play, it being necessary to a successful carom that the cue ball shall, in the course of the stroke, strike not only both object balls, but the cushion as well. The balk line is another limitation which has been imposed on the older game; in this form of the game a balk line eight, fourteen or eighteen inches from the rail is established, and the player is compelled to drive one or both object balls outside the line in order to count. In match games various handicaps are agreed upon, and strict rules concerning the manner of play are adopted. In social play, however, the rules are variously modified and fouls are rarely counted.

Other Details. The strokes are all made with a cue gradually tapering to the end, which is tipped with leather and rubbed with chalk to prevent its slipping off the surface of the ball struck. The cue is taken in the right hand, generally between the fingers and the thumb, and not grasped in the palm. With the left hand the player makes a bridge, by resting the wrist and the tips of the arched fingers on the table and extending the thumb in such a way as to allow a passage in which the cue may slide.

The shape of the table has varied from time to time. At first it was square, with a hole or pocket at each corner to receive the balls driven forward with a cue or mace; then it was lengthened and provided with two other pockets, and occasionally it has been made round, oval, triangular or octagonal, with or without pockets, according to the game required. It is covered with a fine green cloth and is surrounded by elastic india-rubber cushions. The table must be perfectly level and sufficiently firm to prevent vibration; the usual height of the surface from the floor is three feet.

The origin of the game is not known, it being ascribed both to the French and the English.

Billiard Balls. These are made usually from ivory. A good player will not use balls of inferior material, such as bone or a composition. When a tusk reaches the manufacturer, it is examined very carefully for flaws. If found perfect, the tusk is measured into proper lengths, which are two and one-half or three inches, according to the size of the ball desired, and the blocks are then turned into balls. In order to save the corners, the turners cut a ring at each end and slowly deepen it until a rough ring drops off. Two rings are cut from each billiard ball block, after which it is almost round. It is then laid aside to dry for about six months. When it has been seasoned it is chiseled down smooth and exactly round. The ball is then polished by means of a machine and is treated to a rubbing, first with chalk and chamois skin, and finally with a plain, soft leather. Every particle of sawdust and shavings from the ivory is carefully saved. These are treated with chemicals, submitted to an enormous hydraulic pressure and molded into small articles so perfect that only an expert can tell them from solid ivory.

BILLINGS, Josh. See Shaw, Henry Wheeler.

BILLINGS, *bil'ings,* Mont., third city in size in the state, is the center of a great stock-raising district, 240 miles southeast of Helena, on the Great Northern, the Northern Pacific and the Burlington & Missouri River railroads. In addition to its stock shipments it is a wool-shipping center. Railroad shops are located here, and there is also a foundry, a beet-sugar factory, a creamery and numerous minor industries. Among the prominent buildings are a courthouse, a city hall, an opera house and a library. Population, 1910, 10,031; in 1917, 15,123 (Federal estimate).

BIL'LINGSGATE, the principal fish market of London, on the left bank of the Thames, a little below London Bridge. From the character, real or supposed, of the Billingsgate fish dealers, the term *billingsgate* is applied to coarse and violent language.

BILL OF ATTAINDER, a legislative enactment involving capital punishment, or the confiscation of property, of persons accused of high offenses. Such acts are properly the functions of courts, and are unknown in the United States, being prohibited by the Constitution (Art. I, Sec. 9). These bills were formerly commonly passed by the British Parliament, especially in cases of particularly prominent persons, as Thomas Cromwell, the earl of Strafford and William Laud. Such a bill considered matters belonging wholly to the English judiciary and was passed in a most irregular manner, without allowing the accused a trial and upon evidence which was generally insufficient and

often inadmissible. Bills of attainder were abolished in England in 1870. See ATTAINDER.

BILL OF COSTS, in America an itemized list of the fixed costs of an action at law, which is filed by the successful party. After being verified and allowed by the clerk of the court, the amount is added to the judgment assessed against the loser of the case.

BILL OF EXCHANGE, a written order by one person to another, requiring the second to pay to a third person, or to his order or to bearer, at a certain or determinable time, a sum of money. Bills of exchange are *foreign* and *inland*, or *domestic*. The latter is commonly known as a *draft*. A *foreign bill* is one drawn in one state or country upon a person in another. A *domestic bill* is one drawn and payable within one country. The following are common forms:

Inland:

$1000 Chicago, Ill., March 6, 1919

Ninety days after date pay A. B. or order, one thousand dollars, with interest at the rate of six per cent per annum, and charge to account of C. D.

To E. F., Springfield, Ill.

Accepted, E. F.

Foreign:

$1000 London, England, March 6, 1919

At sight of this first of exchange (second and third unpaid) pay to A. B. or order, one thousand dollars, and charge to account of C. D.

To E. F., Chicago, Ill.

Accepted, E. F.

The details of the making of a bill of exchange, or draft, are given in the article DRAFT.

BILL OF HEALTH, a certificate or instrument signed by consuls or other proper authorities, certifying the state of health of crew and passengers at the time that ships sail from ports suspected of being subject to infectious diseases.

BILL OF LADING, or **WAY BILL**, a memorandum of goods shipped on board a vessel or by train, signed by the master of the vessel or freight authority, who thereby acknowledges the receipt of the goods and promises to deliver them in good condition at the place directed, subject to ordinary accidents. The bills are issued in duplicate or in sets of three, one being retained in the offices of the carrying company, one by the master of the conveyance and one by the person shipping the goods. They can be transferred from one person to another by indorsement.

BILL OF RIGHTS, a phrase used in a variety of meanings, to denote an enactment or agreement embodying a fundamental right or principle that naturally belongs to a free people. Thus, a bill of rights has been inserted in the constitutions of most of the states of the United States enumerating rights of the people which shall not be infringed and limitations upon the rights of the state. The same name has been given to the first ten Amendments to the United States Constitution, which were added to satisfy the objection of some of the states, that the Constitution did not cover specifically enough certain inalienable rights of the people.

In English history the Bill of Rights is an act of Parliament passed in 1689, embodying the principles of political liberty now established in the English system of government. It is one of the three great instruments of the British constitution. Bills of rights have frequently been enacted in French history, especially after the Revolution of 1789.

BILL OF SALE, a formal statement certifying to the sale or transfer of personal property. It is a certificate of new ownership, designed to afford proof that the articles enumerated came honestly into possession of the holder. A bill of sale is often given to a creditor as security for borrowed money and empowers the receiver to sell the goods if the money is not repaid at the appointed time.

BILOXI, *bil ok'sie*, MISS., a popular resort city, both in winter and summer, sixty miles southwest of Mobile and eighty miles northeast of New Orleans, on the Louisville & Nashville Railroad. The city is situated on Mississippi Sound, which is a part of the Gulf of Mexico, and on Biloxi Bay, locally known as Back Bay, an arm of the Gulf. On Back Bay are extensive shipbuilding interests.

The city's commerce is largely in oysters and shrimp, the output being worth several million dollars a year. There are twelve canning factories. A fine marble Federal building was erected in 1907, costing $175,000. A fine drive along the shore of the Gulf extends westward thirty miles to Bay Saint Louis. On this road, four miles from Biloxi, is Beauvoir, the former home of Jefferson

Davis, now a soldiers' home. Population, 1910, 8,049; in 1917, 9,932 (Federal estimate).

BIMET'ALLISM, that system of money in which coins of two metals (silver and gold) are legal tender to any amount; or in other words, the concurrent use of coins of two metals as a circulating medium, the ratio of value between the two being arbitrarily fixed by law. It is contended by advocates of the system that by fixing a legal ratio between the value of gold and silver, and using both as legal tender, fluctuations in the value of the metals are in part avoided, and the prices of commodities are therefore rendered more stable; also, that exchanges with countries using one or the other metal as a single standard are facilitated. Monometallists reply that bimetallism will not work, that the cheaper metal will always drive the dearer from use, whatever is the legal ratio (see GRESHAM'S LAW). Bimetallism was a political issue in 1896 in the United States and again in 1900, when William J. Bryan (which see) advocated the free and unlimited coinage of silver, but with the defeat of the principle it ceased to occupy the public mind. Money of the country remains based on the gold standard.

BINDER TWINE, a twine made especially for self-binding harvesters (see REAPING MACHINES), being used to fasten the grain into bundles as it is harvested. About nine-tenths of all binder twine used is made from the leaf fiber of a plant called sisal, which is raised extensively in Yucatan. The United States and Canada together use about 200,000 tons of sisal a year. Manila hemp, obtained from the Philippine Islands, is also a source of binder twine. Machinery enters largely into the manufacture of this twine. The fiber is switched and dusted, to comb out the valueless fiber, after which that to be made into twine is carded and straightened, then made into a narrow, flat ribbon of such size that when twisted it will produce a twine of the desired diameter. The ribbon is twisted by spindles, and from these the twine is wound on large bobbins holding 650 feet each. From the bobbins it is wound into balls, when it is ready for packing for shipment. See SISAL.

BIND'WEED, a genus of plants of the morning glory family, generally having creeping, twining stems and milky juice. The flowers are large and beautiful, but the plants of some species are extremely troublesome weeds, particularly the so-called *English bindweed*. This grows not only by its seeds, but also by slender creeping rootstocks, which

BINDWEED

make it particularly troublesome in grain fields and among hoed crops. If the plant is prevented from seeding and the land is cultivated in the late fall, the weeds may be reduced to control in a few seasons. Coal oil applied to the roots will kill them. The *hedge bindweed* lives in richer soil and has larger flowers a little later in the season. Sometimes the common morning glory runs wild and becomes a weed, but it seldom becomes a nuisance.

BING'EN, GERMANY, a town in the grand duchy of Hesse, at the confluence of the Nahe with the Rhine. Near by, on a rock in the Rhine, is the Mouse Tower, famous in legend. It is said that the cruel Bishop Hatto, in 969, caused hundreds of the poor to be burned to death in a barn, and when he sought refuge in the tower he was eaten up by innumerable rats and mice. An allusion to this story occurs in Longfellow's *Children's Hour*. Restored in 1856, the tower now serves as a beacon, telling ships, by means of a flag, if the Binger Loch is clear. On the opposite bank of the Rhine is the Niederwald Monument, erected in commemoration of the victories of the war with France, 1870–1871.

Every school child knows of Bingen through Mrs. Caroline Norton's poem, *Bingen on the Rhine,* which records the death of "a soldier of the legion" who "lay dying in Algiers." It closes with the line—

> For I was born at Bingen, at Bingen on the Rhine.

The district is noted for the culture of the vine. There are manufactures of tobacco, glue, starch and leather. Population, 1910, 10,200.

BINGHAMTON, *bing'am ton,* N. Y., founded in 1787 as Chenango Point and given its present name in 1800, is the county seat of Broome County, 215 miles northwest of New York City, on the Lackawanna, the Erie and the Delaware & Hudson railroads. The Chenango and Susquehanna rivers unite within the city limits. It has several parks, the largest, Ely Park, containing over 130 acres. The industrial exposition grounds are of more than local note. The state has located here the state hospital for the insane, and there is a state armory. The manufactures include footwear, cameras and photographic supplies, carriages, cotton goods, motors and furniture. The town was incorporated as a village in 1834; it became a city in 1857. Population, 1910, 48,443; in 1917, 54,864 (Federal estimate).

BINOCULAR, *bi nok'u lar,* a microscope equipped with two tubes, so arranged that the observer uses both eyes in viewing objects. See MICROSCOPE.

BINO'MIAL, in algebra, a quantity consisting of two terms or members, connected by the sign + or —. The *binomial theorem* is the celebrated method, devised by Sir Isaac Newton, for raising a binomial to any power, or for extracting any root of it, by forming a series of terms whose coefficients and exponents increase and diminish regularly, according to a certain law. See ALGEBRA.

BIOGENESIS, *bi o jen'e sis,* literally the genesis or source of life, a biological term for the theory that living organisms, from the lowest to the highest, whether animal or vegetable, come into existence only from pre-existing life forms of like nature with themselves. This is now the generally accepted theory; the opposite view, known as spontaneous generation or abiogenesis, being generally discarded. The accepted theory, however, is not free from difficulties, since it leaves us confronted with an insoluble mystery—the origin of life itself.

BIOG'RAPHY, that department of literature which treats of the lives of men and women. Biography in its simple forms is found in the Old Testament accounts of the patriarchs. The legends of the Greeks and Romans were for the most part but biographical accounts of the lives of their gods and heroes. Biography received no great development among the ancient peoples, and it was, even among the later Greeks and Romans, little more than an account of the happenings in the life of a man. Plutarch's *Parallel Lives,* written in the first century after Christ, is the most important of the early biographical works which have come down to us. Although during the Middle Ages many lives of saints and martyrs were written, biography in its modern sense may be considered to date from the seventeenth century. Since that time individual biographies have multiplied enormously.

The ancient method of giving a mere chronicle of events has been greatly modified; selection of the more important events, emphasis on their relation to character, criticism, and even philosophical digressions, have made of biography a much less simple form of literature.

As examples of noteworthy biographies may be mentioned Boswell's *Life of Dr. Johnson,* the most famous of English biographies; Lockhart's *Scott,* Mrs. Gaskell's *Life of Charlotte Brontë,* Forster's *Dickens,* and *Tennyson,* by his son. The life of a person written by himself is called an *autobiography,* and as an example of this kind of writing Franklin's *Autobiography* may be mentioned. There have been many dictionaries of biography, among the best of which are Lippincott's *Pronouncing Biographical Dictionary,* the *English Dictionary of National Biography* and Appleton's *Cyclopedia of American Biography.*

Biography for Children. If the teacher or parent of a child ever hears him say, "I don't like to read biography—I don't care for 'lives' of people," that teacher or parent may be sure that the lives have simply been presented to him in the wrong way. For

everyone, young or old, is naturally interested in "lives"—if they are shown him from the right angle. What, indeed, are most of the stories which so delight children but biography, presented from the point of view which appeals to a child? Joseph, Daniel, David, King Arthur, the Cid, Roland—any child will listen to stories of them told over and over again, and then ask to hear them once more. We expect a child to like stories of these heroes; we pick out the points that will strike the child's fancy, fire his imagination, hold his interest. But our attitude changes when we come to consider other men whom tradition has not marked as children's heroes. "Why," we say, "should a child be interested in the Apostle Paul? A boy or girl does not care particularly for preaching and for missionary work." And we forget that Paul had, if ever a man had, just those experiences that children love to hear about; that he was "in deaths oft, ... in journeyings often, in perils of waters, in perils of robbers, ... in perils of the wilderness, in perils of the sea." Or we think again, "Of course a child doesn't care to read about Dickens or Longfellow or Hawthorne. Of what particular interest is it to him that one man wrote *The Tale of Two Cities* and another man wrote *The Marble Faun?*" But let us see whether we cannot find in what we might at first think of as a biography for grown people plenty that would interest a child. There may be, in such a biography, an apparent lack of proportion; but it is simply an exaggeration of some points, not a distortion. As a child grows older and becomes wider in his interests, he will learn other facts to fit on to and fill out those he has already learned; but he will not need to unlearn anything of what he has remembered.

Charles Dickens

Charles Dickens did not write many things just for children; there is his Child's History of England, which you will read when you get a little older, and there are some of the Christmas stories which will please children almost as well as grown people. But he did not, like Hans Christian Andersen, spend the most of his busy life writing stories for children. However, no one ever loved children more or understood them better. We can see this love in the way he treats the children in his stories. There are many of these children, some of them rich, cared for and happy, but more of them poor or abused or neglected. Later on we shall see why Dickens liked to write about sad little children; just now we shall stop for a time and get acquainted with one or two of the children that everybody knows and that everybody will know as long as there are books and people to read them.

There is little Paul, in Dombey and Son. Everyone loves little Paul, but everyone feels sorry for him, in spite of the fact that he has a father who loves him and is willing and able to give him everything he wants that money can buy. But the poor father has never really loved anybody before, so he does not just know how to love Paul; and Paul, who is sick and weak, can't enjoy the things that other boys enjoy or be happy in the way other boys are happy. This makes him seem strange and old-fashioned, half a little boy and half a little old man. When you read the following description of him when he was at boarding school at Doctor Blimber's, can you make a picture of him in your mind, and do you feel sorry for the strange, frail little boy?

"He grew more thoughtful and reserved every day. . . . . He loved to be alone; and in those short intervals when he was not occupied with his books, liked nothing so well as wandering about the house by himself, or sitting on the stairs, listening to the great clock in the hall. He was intimate with all the paper-hanging in the house; saw things that no one else saw in the patterns; found out miniature tigers and lions running up the bedroom walls, and squinting faces leering in the squares and diamonds of the floor-cloth."

. . . . . .

"Lo and behold, there was something the matter with the great clock; and a workman on a pair of steps had taken its face off, and was poking instruments into the works by the light of a candle! This was a great event for Paul, who sat down on the bottom stair, and watched the operation attentively: now and then glancing at the clock face, leaning all askew against the wall hard by, and feeling a little confused by a suspicion that it was ogling him.

"The workman on the steps was very civil; and as he said, when he observed Paul, 'How do you do, sir?' Paul got into conversation with him, and told him he hadn't been quite well lately. The ice being thus broken, Paul asked him a multitude of questions about chimes and clocks; as, whether people watched up in the lonely church steeples by night to make them strike, and how the bells were rung when people died, and whether those were different bells from wedding bells, or only sounded dismal in the fancies of the living. Finding that his new acquaintance was not very well informed on the subject of the curfew bell of ancient days, Paul gave him an account of the institution; and also asked him as a practical man, what he thought about King Alfred's idea of measuring time by the burning of candles; to which the workman replied, that he thought it would be the ruin of the clock trade if it was to come up again. In fine, Paul looked on, until the clock had quite recovered its familiar aspect, and resumed its sedate inquiry; when the work-

man, putting away his tools in a long basket, bade him good-day, and went away. Though not before he had whispered something on the door-mat to the footman, in which there was the phrase 'old-fashioned'—for Paul heard it.

"What could that old fashion be, that seemed to make the people sorry! What could it be!"

And aren't you glad to find that little by little all the people at the school, the teachers and the pupils and the servants, came to love Paul? This is the way Dickens tells us about it:

"In those days immediately before the holidays, in short, when the other young gentlemen were laboring for dear life through a general resumption of the studies of the whole half-year, Paul was such a privileged pupil as had never been seen in that house before. He could hardly believe it himself; but his liberty lasted from hour to hour, and from day to day; and little Dombey was caressed by every one. Doctor Blimber was so particular about him, that he requested Johnson to retire from the dinner-table one day, for having thoughtlessly spoken to him as 'poor little Dombey'; which Paul thought rather hard and severe, though he had flushed at the moment, and wondered why Johnson should pity him. It was the more questionable justice, Paul thought, in the doctor, from his having certainly overheard that great authority give his assent on the previous evening, to the proposition (stated by Mrs. Blimber) that poor dear little Dombey was more old-fashioned than ever. And now it was that Paul began to think it must surely be old-fashioned to be very thin, and light, and easily tired, and soon disposed to lie down anywhere and rest; for he couldn't help feeling that these were more and more his habits every day."

. . . . . .

"A buzz then went round among the young gentlemen, of 'Dombey's going!' 'Little Dombey's going!' and there was a general move after Paul and Florence down the stair-case and into the hall, in which the whole Blimber family were included. . . . . The servants, with the butler at their head, had all an interest in seeing Little Dombey go; and even the weak-eyed young man, taking out his books and trunks to the coach that was to carry him and Florence to Mrs. Pipchin's for the night, melted visibly."

Florence, Paul's sister, is a lovable little girl, and we are sorry that her father cannot look at her with our eyes and love her as we do and as Paul does.

There is one little boy about whom Dickens tells a great deal, in whom he was particularly interested and in whom we are particularly interested. That little boy is David Copperfield, and the reason that Dickens liked him and that we like him is that while he is called David Copperfield, he was really little Charles Dickens. That does not mean that everything that David says and does in the book Charles Dickens really said and did in his boyhood; but Dickens wanted David to be just the same kind of a boy that he had been; he gave David the same feelings and thoughts which he himself had had as a boy, and he made many of the things happen to David which had happened to him. We will not read anything just now about David, but will see what we can find out about the boy Dickens, partly from what others have told us, and partly from what he himself tells us about David.

Charles Dickens was born in 1812, at Landport, a suburb of Portsmouth. He was less than three years old when the family moved to London, so that he could have no memory pictures of the place in which he was born. But he remembered, as most of us can remember some little thing that happened when we were very little, that everything was white with snow when they moved. Little Charles's family was comfortable enough—they had plenty to eat and to wear, and nobody seemed to worry much about money; for Charles's father was a clerk at a fairly good salary, and while there were a good many children, the money seemed enough to go around. But Charles was different from other boys in some ways. For one thing, he was never very strong, and could not join with other children in all their play, so that he began very early to read, and to read books that most of us do not learn the names of until we are grown up. You see, there were not hundreds and hundreds of books in those days written just for children, with beautiful pictures and big print; and children who really wanted to read had to make what they could out of books written for grown people. But the books that little Charles found in a little room next to his own suited him very well. He could not understand all of them, but he knew that they were adventure stories, and he tells us, in David Copperfield: "I had a greedy relish for a few volumes of voyages and travels—I forget what, now—that were on those shelves; and for days and days I can remember to have gone about my region of our house, armed with the centerpiece out of an old set of boot-trees—the perfect realization of Captain Somebody, of the Royal British Navy, in danger of being beset by savages, and resolved to sell his life at a great price." And all of these stories, as well as some which his own bright little brain made up, Charles used to tell to his brothers and sisters and playmates, so that we may imagine the other children liked to have him with them, even if he wasn't always strong enough to play.

It wasn't only the children that Charles used to tell stories to, either. His father was very proud of his clever little boy, and very often when there was company at the house would keep him up late, far too late for a little boy, telling funny stories and singing lively songs.

But suddenly all Charles's good times came to an end—his schooldays, his comfortable living, everything. In those days if a man could not pay his debts he was sent to prison, and that is what happened to Charles's careless father when Charles was about eleven years old. However, if a man in the debtor's

prison had a little money he could buy good food and make himself fairly comfortable, and so it is likely that Charles's father, in prison, had a better time than Charles, who had been put to work in a blacking warehouse. He worked very hard all day, tying, trimming and labeling blacking pots; he had very little to eat; he slept all night in a miserable little attic; and he had only the roughest boys to talk with; but it was none of those things which made him most unhappy. It was simply that he could see no end to the wretched life; he couldn't see where he was to get any education or any time or chance to do anything worth while. And that was what Charles wanted most in the world—to make something of himself. He was very, very unhappy, so unhappy that he never liked, in his happy later days, to talk about this time. But he has given us, in David Copperfield, a good picture of his life at this time:

"Mr. Quinion then formally engaged me to be as useful as I could in the warehouse of Murdstone and Grinby, at a salary, I think, of six shillings a week. I am not clear whether it was six or seven. I am inclined to believe, from my uncertainty on this head, that it was six at first and seven afterwards. He paid me a week down (from his own pocket, I believe), and I gave sixpence out of it to get my trunk carried to Windsor Terrace at night: it being too heavy for my strength, small as it was. I paid sixpence more for my dinner, which was a meat pie and a turn at a neighboring pump; and passed the hour which was allowed for that meal, in walking about the streets."

. . . . . .

"I was so young and childish, and so little qualified — how could I be otherwise? — to undertake the whole charge of my own existence, that often, in going to Murdstone and Grinby's of a morning, I could not resist the stale pastry put out for sale at half-price at the pastrycook's doors, and spent in that the money I should have kept for my dinner. Then, I went without my dinner, or bought a roll or a slice of pudding. I remember two pudding-shops between which I was divided, according to my finances. One was in a court close to St. Martin's Church,—at the back of the church,—which is now removed altogether. The pudding at that shop was made of currants, and was rather a special pudding, but was dear, two pennyworth not being larger than a pennyworth of more ordinary pudding. A good shop for the latter was in the Strand—somewhere in that part which has been rebuilt since. It was a stout, pale pudding, heavy and flabby, and with great flat raisins in it, stuck in whole at wide distances apart. It came up hot at about my time every day, and many a day did I dine off it. When I dined regularly and handsomely, I had a saveloy and a penny-loaf, or a fourpenny plate of red beef from a cook's shop; or a plate of bread and cheese and a glass of beer, from a miserable old public-house opposite our place of business, called the Lion, or the Lion and something else that I have forgotten. Once, I remember carrying my own bread (which I had brought from home in the morning) under my arm, wrapped in a piece of paper, like a book, and going to a famous alamode beef-house near Drury Lane, and ordering a 'small plate' of that delicacy to eat with it. What the waiter thought of such a strange little apparition coming in all alone, I don't know; but I can see him now, staring at me as I ate my dinner, and bringing up the other waiter to look. I gave him a halfpenny for himself, and I wish he hadn't taken it.

"We had half-an-hour, I think, for tea. When I had money enough, I used to get half-a-pint of ready-made coffee and a slice of bread and butter. When I had none, I used to look at a venison-shop in Fleet Street; or I have strolled, at such a time, as far as Covent Garden Market, and stared at the pineapples. I was fond of wandering about the Adelphi, because it was a mysterious place, with those dark arches. I see myself emerging one evening from some of these arches, on a little public-house close to the river, with an open space before it, where some coal-heavers were dancing; to look at whom I sat down upon a bench. I wonder what they thought of me!"

. . . . . .

"I know I do not exaggerate, unconsciously and unintentionally, the scantiness of my resources or the difficulties of my life. I know that if a shilling were given me at any time, I spent it in a dinner or a tea. I know that I worked from morning until night, with common men and boys, a shabby child. I know that I lounged about the streets, insufficiently and unsatisfactorily fed. I know that but for the mercy of God, I might easily have been, for any care that was taken of me, a little robber or a little vagabond."

But the wretched days did come to an end after about a year, while Charles was still young enough to enjoy the things that other boys enjoy. He was sent to school, and of that school and his comrades there he has written again in David Copperfield.

It is a joy to us to know that Charles did have good times—real "boy" good times—after all his hard days. We like to read of the fun he had with a secret language which he made up, and which sounded like mere gibberish to those who did not know it; we like to hear about the little toy theater, all bright with paint and red fire, in which he made his toy actors act out the stories he was always so fond of writing; and we are sorry that the school days were so short, and that Charles was so soon back at work again. But this time it was more pleasant work. To be sure, he was little more than office-boy in a lawyer's office, but he was at least among people who saw that he was an unusual boy; he had a chance to learn, and time to learn. And he used the time and the chance with all his might. It does not sound unusual to say that he learned shorthand by himself, but it was a long, hard task, to which the boy set himself like a young hero. In his own bright way he has made David tell us some of the

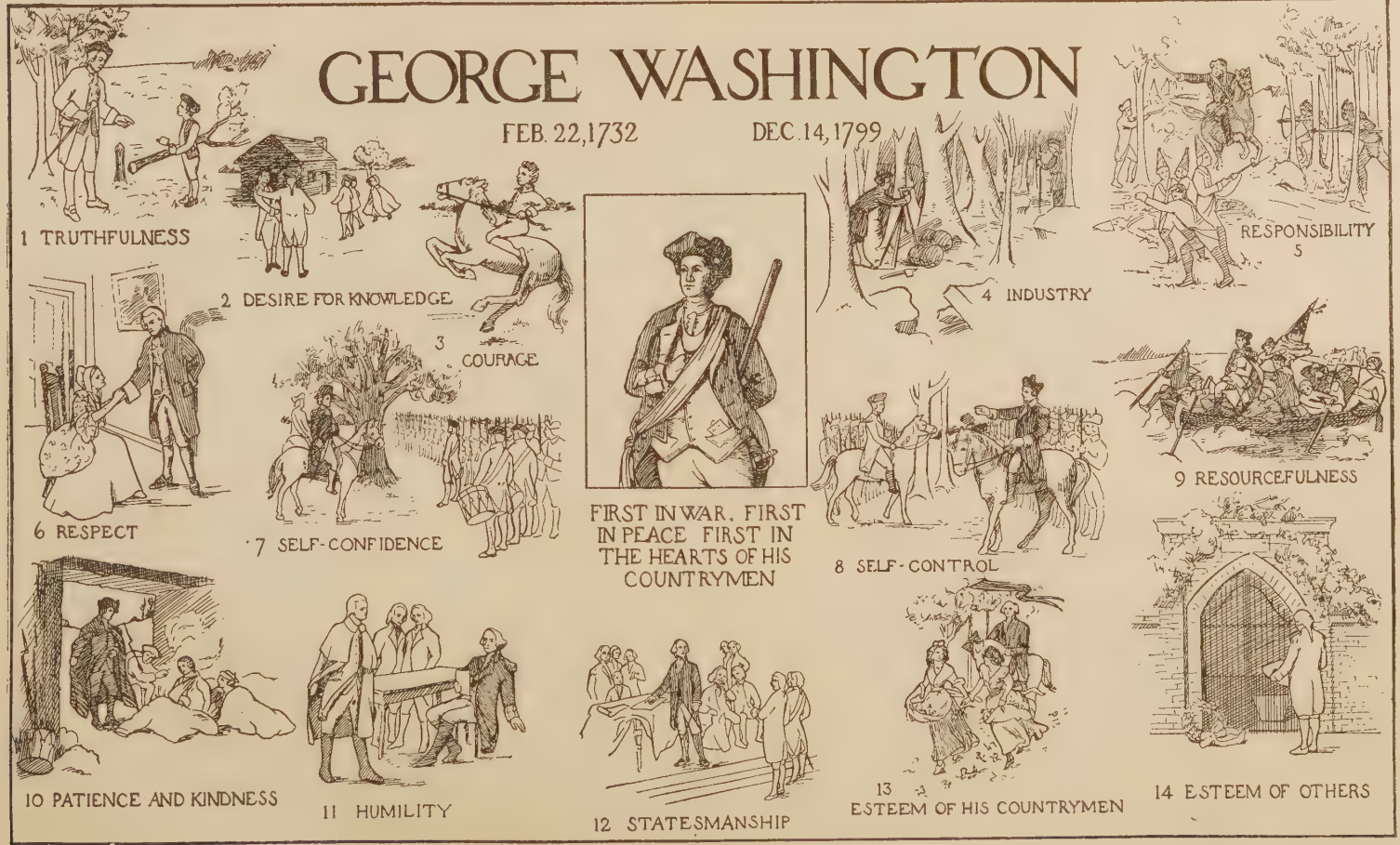
hard things about this shorthand learning. He had learned the alphabet, he says, but "there then appeared a procession of new horrors, called arbitrary characters — the most despotic characters I have ever known; who insisted, for instance, that a thing like the beginning of a cobweb meant 'expectation' and that a pen-and-ink skyrocket stood for 'disadvantageous.'" When the learning period was over, one of his friends said of him, "There never was such a shorthand writer."

Dickens was now a man, more than ready to do a man's work. When you are older you will read his wonderful books, with their characters that everybody knows and remembers as if they were real people. But what we care most about now is the man Dickens. He was a very lovable man, a little quick and excitable and nervous, sometimes, but always bright and entertaining. His children must have been very happy and very proud of their father. He spent much time with them, playing, walking, reading. When he was away he wrote them funny letters; and the Child's History of England he wrote just for his own children, never meaning to have it printed. And once a year he gave all his time and energy to the children's big festival—the private theatricals which were always held at his home during the Christmas holidays. His children and their friends took the chief parts in the plays, and Dickens drilled them and kept them in constant gales of laughter and had as much fun as any of them.

Dickens lived to be only fifty-eight years old. And when he died, people mourned for him as scarcely any other man has been mourned for. For hundreds of thousands of people had read his books, and all of these readers felt as if they had lost a personal friend. His own family wanted him buried near his own home at Gad's Hill; but Dickens had not belonged just to his own family, but to the public which had so loved him and his works. And that public felt that Dickens should be buried in the place where the most famous Englishmen have been buried—in Westminster Abbey. So there, in the Poets' Corner, they placed the body of the great writer whom Englishmen and Americans, grown people and children, loved while he lived and have gone on loving since his death.

DICKENS IN HIS STUDY

Biography in the School. The teacher finds many uses for biography besides the merely intellectual one. There is nothing so helpful in character-building as well-selected, well-presented biographical materials. This does not mean that the admonition "Do thou likewise" is to be given every time a forceful act or a forceful character is presented: in fact, it means quite the opposite. If the factors that made a man great or good are put attractively before him, the child will have an instinctive desire to imitate them. Perhaps the clearest way to present this matter is to give here a brief outline survey of the outstanding characteristics of that first hero of every American school-child—George Washington. The children should know first, of course, the main facts of Washington's



THE CAREER OF GEORGE WASHINGTON
Graphic illustration wherein events emphasize character.

life, that in this study the emphasis may be upon character not upon events. The illustration on the opposite page will make more interesting the items in this summary:

1. **Washington and the Cherry Tree**
2. **The Field School**
   When a lad Washington attended a school taught in a one-room log schoolhouse. Later he attended a better school.
3. **Breaking the Colt**
   Washington's mother owned a colt which no one had been able to ride. Washington determined to break the colt. He succeeded, but the colt was so exhausted that it died. Washington went to his mother and told her he had killed the colt.
4. **Surveying**
   Washington left school at sixteen, and engaged to survey a large tract of wild land for Lord Fairfax. The task occupied his time for three years.
5. **Responsibility**
   When General Braddock was killed in the expedition against Fort Duquesne, the command of the British forces devolved upon Washington. Young as he was, he accepted the responsibility, and did much to save the British army from destruction.
6. **Respect and Reverence**
   Washington always had the highest regard for his mother. He went to bid her farewell before starting to take command of the American army in 1776. After the surrender of Cornwallis, he visited her at the earliest opportunity.
7. **Self-Confidence**
   Washington did not wish the command of the American forces, but when it was thrust upon him he accepted the trust and carried the Revolutionary War to a successful issue.
8. **Self-Control**
   One of the most trying experiences in Washington's entire career was with General Charles Lee at the Battle of Monmouth, yet he did not fail to address Lee in a courteous manner.
9. **Resourcefulness**
   Washington never allowed an opportunity to escape. When crossing the Delaware was supposed to be impossible, he accomplished the feat and inflicted a serious blow upon the British at Trenton.
10. **Patience and Kindness**
    In the darkest hour of the Revolution, Washington never lost heart. He was kind to those dependent upon him in any way. During the winter at Valley Forge he daily visited the sick soldiers and helped them in every way he could.
11. **Humility**
    Washington never felt himself above others. In the unsettled conditions preceding the Treaty of Paris a faction in the army wanted to establish a monarchy with Washington as king. When their proposition was made to him, he refused it with indignation. This is the only instance in history in which a successful conqueror is known to have refused a crown.
12. **Statesmanship**
    Washington's observations upon national affairs, as well as his success in the field, convinced the people that he was the most suitable man for the first President of the United States. He was inaugurated in New York, April 30, 1789. After taking the oath of office he delivered his inaugural address.
13. **Esteem of his Countrymen**
    Wherever Washington appeared on his journey from Mount Vernon to New York, after his election as President, he was received with the greatest honors. As he crossed the bridge at Trenton, young ladies preceded him and strewed flowers in his pathway.
14. **Esteem of Others**
    Upon Lafayette's visit to the United States in 1824 he went in mourning to the tomb of Washington. That act was expressive of the attitude of all European nations at Washington's death, and showed the esteem in which he was held abroad.

As a final summing up of this material on Washington, the pupils will enjoy learning these rules of conduct set down by Washington himself for his own guidance and that of others. It may be said of him more than of most men that he really lived up to his own rules:

Think before you speak.
Feed not with greediness.
Lean not on the table.
Neither find fault with what you eat.
Make no show of great delight in your food.
Let your countenance be pleasant, but in serious matters somewhat grave.
When another speaks be attentive yourself, and disturb not the audience.
Strive not with your superiors in argument, but always submit your judgment to others with modesty.
Undertake not what you cannot perform, but be careful to keep your promise.
Labor to keep alive in your breast that little spark of celestial fire called conscience.

Life of James Wolfe. Another excellent example of biographical style is offered in the following sketch of James Wolfe:

James Wolfe, the hero of Quebec, was born at Westerham, in Kent, England, on the 2d of January, 1727. At Westerham, in a fine old mansion, James and his brother Edward, a year younger, used to romp about. Comparatively little is known of these childhood days, but one seems to see the small eager children,

scampering through the house, playing in the garden with the dogs, or sailing a fleet of toy boats on the waters of a neighboring brook. Or again they might be sitting at the fireside just before bed-time, listening to their father, the stout, gouty colonel, as he told them stories of the battles in which he had fought under Marlborough and Prince Eugene of Savoy. It is little wonder that little red-haired James and his chum, George Warde, who later became a famous cavalry general, roamed the neighborhood on foot or on horseback, fought mimic battles, ambushed each other and solved all sorts of military problems. James' brother, Edward, was supposed to be more interested in books than in battles, but when the time came he followed his brother's example and entered the army. For a short time the two brothers were together in Flanders, but in the autumn of 1744, Edward's regiment was ordered to a new post. Here his health rapidly went to pieces and he died of consumption after a few weeks of suffering. He was only sixteen years old. In writing to his parents about Edward's death, James speaks of his brother as follows:

"He was an honest and a good lad, had lived very well, and always discharged his duty with the cheerfulness becoming a good officer. He lived and died as a son of you two should, which, I think, is saying all I can. I have the melancholy satisfaction to find him regretted by his friends and acquaintances. His Colonel is particularly concerned for him, and desired I would assure (you) of it. There was in him the prospect (when ripened with experience) of good understanding and judgment, and an excellent soldier. You'll excuse my dwelling so long on this cruel subject, but in relating this to you, vanity and partiality are banished. A strong desire to do justice to his memory occasions it."

Written in the formal style of the day, this letter nevertheless helps us to form some idea of Wolfe's character. His respectful devotion to his parents is apparent. Fifteen years later, when he was ordered to Canada, he preferred to leave without seeing his mother, because he felt that she would suffer more from the formality of a farewell visit. This desire to avoid show or display of any kind was especially characteristic of Wolfe, even as a boy. All that he says about his brother may equally well be said of him. A strong desire to do justice to everybody, not only to his brother and parents, is also noteworthy. The story is told that after the battle of Culloden Moor, Wolfe and his commander, the Duke of Cumberland, were riding over the battlefield, when the Duke observed a wounded Highlander smiling defiance at him. Turning to Wolfe, the Duke said, "Wolfe, shoot me that Highland scoundrel who dares look on us with such contempt and insolence." Whereupon the young aide replied: "My commission is at your Royal Highness's disposal, but I can never consent to become an executioner." This was Wolfe at the age of nineteen, daring to disobey because justice and humanity were strong in him. Such qualities as these made his soldiers love him.

Yet Wolfe was a strong disciplinarian. In 1749, when he was major in command at Stirling, he issued the following order: "The Major desires to be acquainted in writing with the men and the companies they belong to, and as soon as possible with their characters, that he may know the proper objects to encourage and those over whom it will be necessary to keep a strict hand. The officers are enjoined to visit the soldiers' quarters frequently; now and then to go round between nine and eleven o'clock at night, and not trust to sergeants' reports. They are also requested to watch the looks of the privates and observe whether any of them were paler than usual, and that the reason might be inquired into and proper means used to restore them to their former vigour." Wolfe's care was always for the men in his charge. To this fact must be attributed much of his success; he always knew the condition of his men, and this, thanks to his foresight, was nearly always perfect. The responsibilities of his command weighed upon him. "You can't conceive," he writes to his mother, "how difficult a thing it is to keep the passion within bounds, when authority and immaturity go together. Fancy you see me, one that must study the tempers and dispositions of many men, in order to make their situation easy

MAJOR-GENERAL JAMES WOLFE

and agreeable to them, and should endeavor to oblige all without partiality, a mark set up for everybody to observe and judge of." He was less concerned with his personal affairs than with the affairs of his soldiers. It was always his men of whom he was thinking.

Wolfe was not lacking in self-confidence and independence when these were necessary, as the anecdote of his reply to the Duke of Cumberland shows. Though he was much younger than most of his fellow-officers, he

felt that he was wasting his time in Scotland and constantly chafed under the restraints of garrison life. Yet he made the best of matters. An episode illustrating this may be mentioned. After spending only a few weeks at Stirling, he was ordered to Glasgow. It was now over six years since Wolfe had attended school and he began to realize the deficiencies in his education. Consequently, though he was acting as commander of the troops in a great city, he put himself in the hands of teachers from the University of Glasgow and spent at least two hours each day in studying mathematics and Latin. In a letter to a friend he says he is trying to "repair the damages of my education." For several years he continued his studies, until, as he humorously remarks in a letter to his father, he had "grown perfectly stupid."

The outbreak of the Seven Years' War in 1756 gave Wolfe his great opportunity. He took part in an expedition against Rochefort, a seaport of France. Though the expedition failed miserably, he distinguished himself by his good sense and decision, when all the other officers threw away their opportunities in useless argument. The failure of the expedition disgusted Wolfe the more because the chances of success had been so good. Now Wolfe turned his attention to America. Like Pitt, he realized that in America was to come the real struggle. "In America," wrote Pitt, "England and Europe were to be fought for." The French under Montcalm had just captured Fort William Henry and were driving the English before them. At this crisis radical measures were necessary. Three expeditions, against Fort du Quesne, Ticonderoga and Crown Point, and Louisburg, were to save the English cause. Wolfe was created brigadier-general and in May, 1758, arrived at Halifax. The expedition against Louisburg succeeded, as Wolfe had confidently expected. The fortress was unable to withstand the fire of the enemy and after a short siege surrendered. The engineer who directed the approaches at Louisburg was a very formal man and Wolfe did not hesitate to complain of his slowness. "My maxim," said the engineer, "is 'slow and sure.'" "And mine," instantly replied Wolfe, "is 'quick and sure'—a much better maxim." The retort is characteristic of Wolfe. He himself could be formal, but when the time came to strike, he struck and struck hard. He was more than a mere machine; he was one of the most brilliant soldiers England ever had. Though only a subordinate officer, he was generally hailed as the hero of Louisburg and Pitt had already marked him out to lead the expedition against Quebec..

On the 14th of February, 1759, the expedition against Quebec set sail from England, and on the 30th of April it reached Halifax. Every child knows the rest of the story—the preparations, the disappointments and setbacks, the quarrels with his brigadiers, and the final victory on the Plains of Abraham. Hot-headed and independent by nature, at the supreme crisis of his life, Wolfe was hampered by difficulties which only served to bring out his sterling qualities. On the night of the 12th of September the British army climbed the steep path from Wolfe's Cove and on the morning of the 13th stood on the Plains of Abraham ready to give battle. A conspicuous figure was Wolfe—over six feet high, in his bright new uniform, a man daring, impetuous, absolutely without fear. Leading the charge, he was mortally wounded. Just before he died he heard the words, "They run—they run." "Who run? " he asked earnestly. "The enemy, sir," came the answer. Wolfe gave a brief command in regard to his troops, then turned on his side, and murmuring, "Now God be praised, I die happy," in a few moments passed away.

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ASTRONOMERS

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Astor, William B.
Astor, William Waldorf
Belmont, August
Carnegie, Andrew
Cooke, Jay
Field, Cyrus West
Field, Marshall
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Gould, Jay
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Harriman, Edward H.
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Mackay, Clarence
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Sage, Russell
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Vanderbilt, William K.
Wanamaker, John

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Hearst, William R.
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EXPLORERS

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See Mathematics.

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MUSICIANS

See Music.

MILITARY AND NAVAL LEADERS

American

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Anderson, Robert
Arnold, Benedict
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Bliss, Tasker H.
Breckinridge, John C.
Brown, John
Buckner, Simon B.
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Bullard, Robert Lee
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Butler, Benjamin F.
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Funston, Frederick
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Hampton, Wade
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Marlborough, Duke of
Moore, Sir John
Nelson, Horatio
Oglethorpe, James E.
Pakenham, Edward M
Saint Leger, Barry
Wellesley, Marquis
Wellington, Duke of
Wolfe, James
Wolseley, Garnet J.

French

Foch, Ferdinand
Joan of Arc
Joffre, Joseph J.
Lafayette, Marquis de
Murat, Joachim
Napoleon I
Ney, Michel
Pétain, Henri

German

Blücher, Gebhard von
Hindenburg, Paul von
Ludendorff
Moltke, Helmuth C.
Moltke, Helmuth J.
Steuben, Baron von

Others

Aguinaldo, Emilio
Alexander the Great
Bolivar, Simon
Caesar, Caius Julius
Charlemagne
Garibaldi, Giuseppe
Hannibal
Nogi, Ki-teu
Oyama, Iwao
Pompey
Pyrrhus
Santa Anna, Antonio
Togo, Heihaichiro
Tromp, Martin H.
Xenophon

NATURALISTS

Agassiz, Louis J.
Audubon, John J.
Burroughs, John
Cuvier, Baron
Darwin, Charles R.
Huxley, Thomas H.
Lamarck, Jean B.
LeMoine, Sir James
Linné, Karl von
Wallace, Alfred R.

NOVELISTS

See Novel.

ORATORS

See Oration.

PAINTERS

See Painting.

PHILOSOPHERS

See Philosophy.

PHYSICIANS

See Medicine.

PHYSICISTS

See Physics.

PIONEERS

Boone, Daniel
Carson, Christopher
Clark, George Rogers
Crockett, David
Ross, Alexander

POETS

See Poetry.

PRESIDENTS OF THE UNITED STATES

See President.

PSYCHOLOGISTS

See Psychology.

REFORMERS

Addams, Jane
Anthony, Susan B.
Bergh, Henry
Booth (family)
Calvin, John
Catt, Carrie C.
Dow, Neal
Garrison, William L.
Gough, John B
Huss, John
Knox, John
Livermore, Mary A.
Lockwood, Belva A.
Luther, Martin
Melancthon, Philip
Mott, Lucretia C.
Owen, Robert
Phillips, Wendell
Stanton, Elizabeth C.
Tyndale, William
Willard, Frances E.
Wycliffe, John

RELIGIOUS LEADERS

See Religion.

RULERS

See articles on countries.

SCULPTORS

See Sculpture.

SOCIALISTS

See Socialism.

STATESMEN

American

Adams, Charles F.
Adams, Charles F., Jr.
Adams, Samuel
Aldrich, Nelson W.
Beveridge, Albert J.
Blaine, James G.
Blair, Francis, P.
Blair, Francis P., Jr.
Blair, Montgomery
Bland, Richard P.
Bonaparte, Charles J.
Breckinridge, John C.
Bryan, William Jennings
Burlingame, Anson
Burr, Aaron
Calhoun, John C.
Cannon, Joseph G.
Carroll, Charles
Cass, Lewis
Chase, Salmon P.
Choate, Joseph H.
Clark, Champ
Clay, Henry
Clinton, DeWitt
Conkling, Roscoe
Cullom, Shelby M.
Cummins, Albert B.
Davis, Jefferson
Depew, Chauncey M.
Douglas, Stephen A.
Fairbanks, Charles W.
Franklin, Benjamin
Gallatin, Albert
Gillett, Frederick H.
Grant, Ulysses S.
Hamilton, Alexander
Hamlin, Hannibal
Hancock, John
Hanna, Marcus A.
Hay, John
Hayne, Robert Y.
Hughes, Charles E.
Jay, John
Johnson, Hiram W.
Kendall, Amos
Knox, Philander C.
La Follette, Robert M.
Livingston, Robert R.
Lodge, Henry Cabot
Logan, John A.
McAdoo, William G.
Marshall, Thomas Riley
Morrill, Justin S.
Morris, Gouverneur
Morris, Robert
Morton, Julius S.
Morton, Levi P.
Olney, Richard
Otis, James
Page, Walter H.
Parker, Alton B.
Pinckney, Charles C.
Randolph, John
Reed, Thomas B.
Reid, Whitelaw
Root, Elihu
Schurz, Carl
Sherman, John
Stanton, Edwin M.
Sumner, Charles
Tilden, Samuel J.
Underwood, Oscar
Webster, Daniel
White, Andrew D.
Whitlock, Brand
Yates, Richard

Canadian

Abbott, Sir John J. C.
Blake, Edward
Borden, Sir Robert
Bowell, Mackenzie
Brown, George
Cartier, Sir Georges E.
Chapleau, Sir Joseph A.
Davies, Sir Louis H.
Laurier, Sir Wilfrid
Macdonald, Sir John A.
Mackenzie, Alexander
Mackenzie, William L.
Strathcona and Mount Royal, Lord
Tupper, Sir Charles

English

Asquith, Herbert H.
Balfour, Arthur J.
Bright, John
Buckingham, Duke of
Burke, Edmund
Campbell-Bannerman, Sir Henry
Carson, Sir Edward
Chamberlain, Joseph
Churchill, Winston L.
Clarendon, Earl of
Cobden, Richard
Connaught, Duke of
Cromwell, Oliver
Curzon, Lord
Devonshire, Duke of
Disraeli, Benjamin
Dufferin and Ava, Marquis of
Fox, Charles J.
George, David Lloyd
Gladstone, William E.
Grey, Earl
Grey, Edward Viscount
Hampden, John
Hastings, Warren
Law, Andrew Bonar
Milner, Alfred
Montford, Simon de
North, Lord
Peel, Sir Robert
Pitt, William
Walpole, Horace
Walpole, Sir Robert

French

Briand, Aristide
Cambon, Jules Martin
Carnot, Marie François
Casimir-Perier, Jean Paul
Clemenceau, Georges B.
Delcassé, Theophile
Fallieres, Clement Armand
Faure, François Felix
Gambetta, Leon
Genet, Edmond Charles
Grevy, Jules
Hébert, Jacques Rene
Lafayette, Marquis de
Loubet, Emile
Mazarin, Jules
Mirabeau, Count de
Poincaré, Raymond
Richelieu, Cardinal
Talleyrand-Perigord, Duke de
Thiers, Louis Adolphe

German

Bernstorff, Johann H.
Bethman-Holweg, Theobald
Bismarck-Schönhausen
Caprivi, George Leo
Ebert, Friedrich
Liebknecht, Karl

Greek, (Ancient and Modern)

Alcibiades
Aristides
Draco
Epaminondas
Lycurgus
Pericles
Pisistratus
Solon
Themistocles
Venizelos, Eleutherios

Irish

Davitt, Michael
Dillon, John
O'Connor, T. P.
Parnell, Charles Stewart
Redmond, John E.

Italian

Cavour, Count Camillo
Crispi, Francisco
Machiavelli, Niccolo

Mexican

Carranza, Venustiano
Diaz, Porfirio
Huerta, Victoriano
Madero, Francisco

MISCELLANEOUS

Alden, John
Aspasia
Beatrice Portinari
Beard, Daniel C.
Blennerhassett, Harman
Blondel
Boleyn, Anne
Bothwell, James Hepburn
Bridgman, Laura D.
Camp, Walter
Carteret, Sir George
Carver, John
Catiline
Cenci, Beatrice
Corday d'Armont, Marie Anne Charlotte
Coriolanus
Coverdale, Miles
Crassus, Marcus Licinius
Crichton, James
Damocles
Damon and Pythias
Darling, Grace H.
Dinwiddie, Robert
DuBarry, Marie Jeanne
Erasmus, Desiderius
Faust, Johann
Frohman, Charles
Gerard, James W.
Grey, Lady Jane
Hoover, Herbert
John of Gaunt
Josephine, Marie Rose
Keller, Helen Adams
Kidd, William
Lenine, Nikolai
Olmsted, Frederick L.
Peter the Hermit
Petrarch, Francesco
Pinchot, Gifford
Robin Hood
Rob Roy
Rolfe, John
Selkirk, Alexander
Smith, John
Spartacus
Standish, Miles
Stradivarius, Antonio
Trotzky, Leon
Washington, Martha
Webster, Noah

Value of Questions in Biography. As a means of stimulating interest in the lives of great men and of increasing one's store of information, questions in biography have very great value. Reading the questions is not enough, however. The question is of real value only when it excites in the reader a desire to pursue the trail indicated. This desire must be strong enough to incite him to action. The clue having been given, it is necessary for the inquirer to look up the answer, which is to be found somewhere in the biography in question. It may be necessary to read the entire sketch before the particular point is found. The questions which follow are presented for the purpose of stimulating curiosity and inducing the reader to investigate freely the wealth of information at his disposal. For the convenience of the reader the questions are classified into various groups, such as history, literature, etc.

Questions in Biography

Famous Women

What was George Eliot's real name? In what story does she portray her girlish personality?

What names have made the reign of Elizabeth one of the most famous literary periods of all time?

What famous poetic drama was inspired by the life of Beatrice Cenci?

What national association was organized by Susan B. Anthony? Who worked with her in this movement?

What painting by Rosa Bonheur was purchased for $55,000 by Cornelius Vanderbilt?

What is Louisa M. Alcott's most popular book?

What poem by Elizabeth Barrett led to her marriage to Robert Browning?

For what achievement is Jane Addams famous?

In the plays of what author has Maude Adams been most successful?

Who was the first president of the American Red Cross Society?

For what are Alice and Phoebe Cary celebrated?

Who was Hypatia? What led to her brutal murder by the clergy?

How old was Queen Victoria when she ascended the throne? How many years did she reign? When and at what age did she die?

At what age did Wilhelmina become queen of the Netherlands?

In what field of labor did Frances Willard become world-famous? Where was she born?

Was Emma Hart Willard, who wrote "Rocked in the Cradle of the Deep," related to Frances Willard?

What are some of the principal productions from the pen of Mrs. Humphry Ward?

Who was the first chief of the Federal Children's Bureau?

For what is Jeannette Rankin noted?

Actors and Dramatists

How is Henry Irving regarded as an actor?

Of what nationality is Ellen Terry? How does she rank as an actress?

In what world-famous play did Joseph Jefferson take the leading part?

In the presentation of what plays did Edwin Booth win fame?

What is the nationality of Bernhardt? For what lines of work is she noted other than acting?

What are the principal dramas of Shakespeare presented to-day?

In what lines of activity has David Belasco won fame? George M. Cohan?

Artists

How does Rosa Bonheur rank as an artist? When did she die?

What was the last and unfinished painting of Raphael?

Is Dante Rossetti more famous as a poet or as a painter?

What are the chief qualities in the art of Rodin?

How many paintings did Rubens produce?

What picture by Titian has been described as faultless?

What are Raphael's greatest works? Name three.

Who were representative artists of the Cubist School of Painting?

What sculptor made the statue of "Liberty," overlooking New York harbor?

Discoverers and Explorers

What famous search mission was undertaken at the suggestion and expense of James Gordon Bennett?

How did it happen that the new continent was named after Americus Vespucius?

Where did Andree start on his balloon expedition to the North Pole? What was the result?

What were the education and the early tastes of Christopher Columbus?

Which was the most famous of Drake's voyages?

How was Vasco da Gama rewarded by the Portuguese government for being the first to round the Cape of Good Hope?

What was the farthest northern point reached by Nansen?

What was Robert E. Peary's greatest achievement?

From what very humble origin did Livingstone make his way to fame?

Who is Captain Roald Amundsen? What did he do to entitle him to fame?

Where is Robert F. Scott buried? Who found his grave?

What discoveries were made by Sir Ernest Shackleton?

Educational

What is the rank of William R. Harper as an educator?

Along what lines did Booker T. Washington work in the education of the negro?

For what is Euclid noted? Sir Isaac Newton?

Who were the modern followers of Aristotle?

What was the great good in life and the great evil according to Epicurus?

For what is William T. Harris distinguished?

Of what university was James B. Angell president?

What is the plan of the Carnegie Institution? Where is it located?

Who founded Harvard University, and when?

Who was Horace Mann?

What investigation did Professor Harry Judson make for President Wilson?

What women's college has been established in connection with Harvard?

Historical

What were the various stages of negro emancipation?

From what social class was Washington descended and how long had his family been in America?

Where did Croesus obtain his proverbial wealth?

Who was Marcus Aurelius?

What was the career of Caius Marius?

What is the story of Romulus and Remus?

For what was Alfred the Great noted?

What was Kitchener's contribution to the allied cause? How did he lose his life?

What was the far-reaching object of Lycurgus?

What repeated penalties did William Penn suffer for his Quaker opinions?

What parliamentary acts were passed in Asquith's Ministry?

What were the great events of Queen Victoria's reign?

Who was Chinese Gordon or Gordon Pasha?

Who was the last ruler of the Hohenzollern line? The Hapsburg?

What Presidents of the United States have been assassinated?

What precedent did President Wilson break in attending the Peace Conference?

For what are the following persons noted: Clemenceau, Venizelos, Lloyd George, Ebert, Liebknecht and McAdoo?

What new nations have risen from the ruins of Austria-Hungary?

Who are the Russian Bolsheviki?

Why did America enter the World War?

Inventors

Where was the first locomotive engine made in the United States, and from whose plans was it constructed?

How is the story of Thomas Edison's life typically American?

What is the great invention of George Westinghouse?

What American ship famous in the Civil War was invented by Ericsson? What effect did it have on naval warfare?

When did Howe invent the sewing machine?

What machine invented by Eli Whitney has been the means of the saving and making of millions of dollars every year?

Who is Marconi? What is his important discovery?

Who originated the submarine?

What names are associated with the development of the flying machine?

Religious

For what is Robert Raikes noted?

Who was John Huss? Why did he suffer martyrdom?

Who protected Calvin after he had renounced Roman Catholic faith? How did the Calvinist sect arise?

What famous duel was made the subject of one of Lyman Beecher's most noted sermons?

Of what religion was Zoroaster the founder?

Of what famous educational movement was Bishop Vincent the founder?

Who was Savonarola?

To what form of religion did Voltaire hold in denouncing Christianity?

In what way was the Society of Jesuits formed?

When did Leo XIII become Pope and how many years was he at the head of the Roman Catholic church?

Who was the founder of the Church of Christ, Scientist?

At the head of what great religious and charitable movement was William Booth?

What methods are used by "Billy" Sunday?

Musicians

What rank does Jan Kubelik take as a violinist? Maud Powell? Mischa Elman?

To what king was Mendelssohn appointed musical director?

What was Mme. Nordica's nationality? What was her rank as a singer?

When was Sousa's band first organized?

For what is Antonio Stradivarius noted?

From what did Wagner select his subjects?

For what is Caruso noted? John McCormack?

Military and Naval

In what tragic way did Montezuma bring death upon himself?

Why was General Grant called "Unconditional Surrender" Grant?

What part did Rear-Admiral Schley play in the war with Spain?

How did Pershing help win the World War?

When did Dewey become an admiral?

When did General Weyler leave Cuba?

When did Funston capture Aguinaldo?

Who is Captain Dreyfus? What persecutions had he been subjected to, and why?

Who commanded the Invincible Armada?

In what famous battle were the Confederate forces successful under the leadership of Bragg?

What American cities were visited by Joffre?

What Japanese leaders won fame in the Russo-Japanese war?

How did Hindenburg restore public confidence in himself?

How did Foch wring victory from defeat?

The signing of what document ended fighting in November, 1918?

Philosophers

What famous simile did John Locke make in describing the human mind?

In what direction has Hegel's philosophy made itself most powerfully felt?

What was Plato's philosophy?

Who were the Seven Wise Men?

What system of reasoning did Sir Francis Bacon advocate?

What system of philosophy did Auguste Comte found?

What was Socrates' method of arriving at the truth?

What is Henri Bergson's theory of time?

Political

For what reason did McKinley receive more than the average vote of his party in 1896?

For what was Cleveland's second administration memorable?

At what very early period did Martin Van Buren enter political life?

How did James A. Garfield's unexpected nomination for the Presidency come about?

Of what party was John C. Breckinridge once the candidate for the Presidency?

How many times was Henry Clay defeated for the Presidency? What is his famous saying in this connection?

What was the cause of the split in the Republican party in 1912?

Rulers

Who is the present Sultan of Turkey?

For what reasons was Marie Antoinette unpopular with the French populace?

When was the title "Empress of India" conferred upon Queen Victoria?

Who is the present king of Denmark? Of Norway? Whom did the latter succeed?

Over what celebrated woman did Mary I triumph in ascending the throne?

What is the meaning of "Hapsburg"?

Who is the present ruler of Holland?

Who was Queen Elizabeth's mother?

Why was George IV given the nickname of "First Gentleman of Europe"?

What great events occurred in George V's reign?

What peculiar relationship did Christian IX bear to various royal families?

How did Edward VII of England influence European politics?

Who is the heir apparent to the throne of Holland? Of Belgium?

Why is Albert I of Belgium an heroic figure?

Why was Constantine of Greece forced from his throne?

What rulers abdicated in 1918?

Statesmen and Orators

Why was John Adams not reëlected? On what anniversary did he die?

When did John Sherman resign his position as Secretary of State?

Who was at the head of the War Department during Lincoln's administration?

What principle dominated Webster through all his political life?

What was Gladstone's public career?

How long was Herbert Asquith Premier of England?

Compare personal characteristics of Roosevelt and McKinley.

How is John Hay regarded as a diplomat?

Who was Paul Kruger? For what principles was he fighting?

Who was Ito? What did he do for his country? In what way did the United States help him?

Why is Woodrow Wilson called a world statesman?

What speech resulted in the nomination of Bryan to the Presidency in 1896?

What were some of the characteristics of Beecher as a speaker?

What is there remarkable about Lloyd George?

Why is Clemenceau called the "tiger of France"? What did he achieve?

Who succeeded William McAdoo as Secretay of the United States Treasury?

Patriotic

In what way did Congress make recognition of Lafayette's services?

What saying by Admiral Nelson has become an English slogan?

How did the nation honor his memory years later?

Who was Kosciusko?

Who was Robert Emmet? For what was he executed?

What part in affairs of Colonial times did Patrick Henry take? What is his famous saying?

For what was Joan of Arc noted?

In what way did Florence Nightingale serve her country?

Who was James Lawrence? When did he utter the famous words: "Don't give up the ship"?

Scientific

For what is Pasteur noted? Professor and Madam Curie?

By whom was radium discovered?

What is liquid air? Who has been the most successful experimenter with it?

What are the principles on which the barometer works? Who invented it?

Who invented the type of balloon known as the Zeppelin?

Who founded the Agassiz Association? What was his object?

Who discovered the method of obtaining ammonia from sal-ammoniac?

For whom is the electrical unit *ampere* named? What theory did he originate?

Who is Hiram Maxim and for what is he noted? John Hays Hammond, Jr.?

What deadly explosive was invented by Alfred Nobel? What are the Nobel prizes?

For what is Alexis Carrel noted?

COMMON AMERICAN SONGSTERS

1, Cerulean Warbler.
2, Bluebird.
3, American Goldfinch
4, White-Throated Sparrow.
5, Baltimore Oriole.
6, Blackburnian Warbler.
7, Cardinal Bird.
8, House Wren
9, Redstart

BIOL'OGY, the study of living things and the phenomena of life. It deals with the whole organic world and tries to determine the laws which separate this field from the inorganic world. Beginning with the simpler forms of one-celled plants and animals, that can be studied only by the aid of a microscope, it includes the more complicated forms of both plants and animals and all the relations that exist between them. To show what life, present and future, really is, and what man's relation is to the entire world, are the purposes of biology. Biology, then, must include all such sciences as botany, zoölogy and ethnology, and is so extended and comprehensive that no one man can master the whole of it. The ordinary student interests himself solely in a small section of the field. In the public schools the name biology is applied to the study of the lower orders of plant and animal life and usually includes such work as compels the use of the microscope. See BOTANY; ZOÖLOGY.

BIRCH, *burch*, a genus of trees which comprises only the birches and alders, found in North America, Europe and Northern Asia. The common birch is extremely hardy, and only one or two other species of trees approach so near to the North Pole. The wood, which is light in color and firm and tough in texture, is used for chairs, tables, bedsteads and the woodwork of furniture generally, also for fish-casks and hoops, as well as for many small articles. In Northern Europe wooden shoes are made of it. The bark is whitish in color, smooth and shining, separable in thin sheets or layers. The fruit is cone-shaped, and the seeds are flat and winged, thus easily scattered by the wind (see SEED DISPERSAL).

In some countries birch bark is made into hats, shoes, boxes and other small articles. Fishing-nets and sails are steeped with birch bark to preserve them. The sap, which may be drawn from the tree during warm weather in the end of spring or beginning of summer, is so sweet that an agreeable wine is made from it in Central Europe. The *dwarf birch*, a low shrub not more than two or three feet high at most, is a native of all the most northerly regions.

In the United States the *white* or *paper birch* is a fine tree, with valuable, close-grained wood. It was from the bark of this tree that Indians made their birch canoes, and the thin, clean layers of the bark have been used instead of paper to write upon. The *yellow birch* is a large tree with yellowish bark. Both species are common in the north.

BIRDS, the only feathered creatures of the animal kingdom. They belong to the back-boned or vertebrate group, are warm-blooded, and most of them can fly. Because of their varied and beautiful coloring, their gift of song and the gentle nature of the majority, birds are perhaps the best loved by mankind of any group of animals. It is true that some species, like the hawk and the vulture, have seemingly no lovable qualities; there are birds, too, of ugly shape and plumage, and there are birds which utter harsh cries instead of singing notes. Yet, to the average person, the word *bird* brings altogether pleasant associations—thoughts of a graceful bright-hued form flitting through the trees, of a nest of tiny creatures fed by a devoted mother, of a chorus of woodland songsters. In some respects birds are the most interesting animals one can study, and practical suggestions along that line will be found in this article.

Habits. Birds usually live in pairs, rearing their young in homes which they make themselves, though there are some remarkable exceptions to this rule. All birds lay eggs from which young are hatched. In the higher orders, such as the robin and meadow lark, the young are naked when they break from the shell and must be cared for and fed by the parents, but in some of the lower species the little ones are covered with tiny hairs and in others covered with a complete suit of feathers before they hatch. In the latter case the young are able to take partial care of themselves very soon after they appear. The grouse, quail and duck are examples of birds whose young are feathered when hatched. The eggs vary in number from two to several dozen, seeming to be proportioned to the dangers the young are to meet, but being practically the same number at every sitting of each species. The eggs which are hatched by heat are sometimes buried in rotting vegetation, or in the sand under the hot sun, but more frequently they are laid in artificial nests or in some natural

receptacle, and are there brooded and kept warm by the body of the female until the chick matures and emerges. This is usually a period of from two to three weeks.

Flight. Nothing is more wonderful than the flight of birds. Their wing power is extraordinary, but the speed with which they fly has doubtless been exaggerated. Their endurance is much more surprising. Some of the smallest and apparently feeblest of birds, that usually confine their flight to short dashes from bush to bush, may during their migrations cover in a single flight distances ranging from 500 to 2,000 miles. In order that the body, relatively so heavy, may be carried through the air, the muscles which move the wings must be very strong and have a strong frame for their attachment. The frame is furnished by the wide breast bone. But strong muscles alone would be insufficient were there not in the body air cavities, which sometimes extend even into the bones and feathers.

The wings, which are the chief organs of flight, are modified fore limbs, corresponding to the arms of a human being. From the body of the wings grow strong feathers with heavy quills, making a broad surface with which the bird can beat the air. The heavy quills are covered both above and below with short feathers, which prevent the air from passing through. The tail does not help much in flight, but it is rather a rudder by which the bird steers itself and holds its body level. The feathers which cover the entire body are small and overlap, but they do not grow uniformly everywhere, being distributed in certain definite patches or areas.

Food. The food of birds varies widely accordingly to the species. No living bird has teeth, but the beak of each species is fitted to handle the food which it eats. No arrangement provides for the chewing of the food, so the bird's organs of digestion are peculiar. After the food is swallowed it finds lodgment first in the *crop,* a large sack at the bottom of the gullet. Here the food is soaked and softened for some time. It is passed on to the *gizzard,* a kind of stomach, with exceedingly strong muscular walls and tough, hard, wrinkled lining. Here the food is ground fine by vigorous rubbing, sometimes aided by small pebbles and gravel eaten by the bird. Naturally the meat-eating birds have smaller gizzards, with thinner muscular coats, and in some species there is no gizzard at all. The quantity of food required by birds is enormous, and in this necessity lies their chief value to the horticulturist.

Senses. Their sense of sight is keen, and in some species it is little less than marvelous. The eye is very much like that of a human being, but it has a third lid, which can be drawn at will so as partially to shut out the light. The nostrils open through the upper part of the beak, and in some birds the sense of smell is exceedingly keen. Although birds have no external ears, yet most of them are extremely sensitive to sound. The senses of taste and touch are dull, yet both are possessed by the bird. While not a large number of birds can be said to sing, yet songs are among the most pleasing and attractive of their characteristics. Some are able to utter only discordant, disagreeable notes, but others, like the crow, seem to have developed a language of their own, and not a few can be taught to speak words. Ordinarily, only the male birds can sing, and those which are most brilliant in plumage are the poorest singers. In general, the singing birds are small and lively, living principally upon grains and fruits. A remarkable trait of birds is their instinct for returning directly to their homes after having been away, as may be seen in the return of the homing pigeon and the return of many species from the winter migration to old homes in the north.

Lessons on Birds

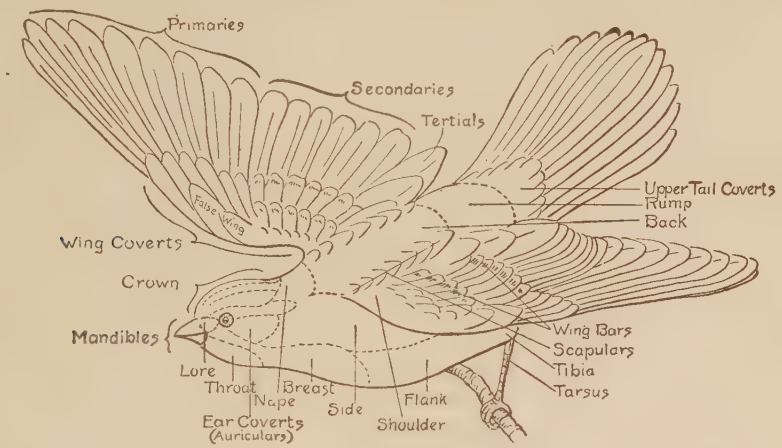
General Suggestions. 1. An eminent authority on nature study says: "The way to a bird's heart is through its crop." Success in bird study depends upon our ability to approach the bird, and birds can be tamed only by feeding them. Some of the first lessons should be devoted to giving instructions about feeding and taming birds.

2. To be successful in this work, the teacher must have a much more extended knowledge than it will be possible to use in class. She must know the size, color and song of the bird, and be able to distinguish between the male and female, and in addition to these facts she must know the bird's habits, its haunts, what it feeds upon, how it apprehends its food, when and where it nests, when the young appear, how long the fledglings remain in the nest and the dangers they are subject to when they leave the nest. The teacher should be able to show the chil-

dren how they may assist the young birds in escaping these dangers. At this stage many birds perish from the want of proper care. Moreover, only young birds can be tamed.

3. Bird study is preëminently an outdoor exercise, and but little time can be profitably spent upon it in school.

4. Time spent in class should generally be devoted to hearing reports and giving directions for further observations. When the study of a bird has been carried far enough for a review, this should be given as a class exercise. The review should then be written, thus furnishing a good drill in language.



PARTS OF A BIRD

5. Valuable information relating to the study of birds will be found in these volumes in the articles *Egg* and *Nest,* and in those describing the different birds, such as *Bobolink, Robin, Swallow;* the color plates *Common American Songsters* and *Orders of Birds; Birds' Eggs,* with the article *Egg,* and *Birds' Nests,* with the article *Nest,* will give both teacher and pupils excellent ideas of the color and form of the objects illustrated. These articles and color plates should be frequently consulted.

Directions for Observations. 1. All children are interested in watching for the return of birds in the spring. Ask them to report the first birds they see. Keep a record of these reports, as follows:

The first crow, March 1.

The first robin, March 10.

Besides the school record, each pupil should keep a record for himself. Give complete and careful directions for observing birds. This work is usually more successful when the pupils make their observations alone or in companies of not more than two or three. Birds are easily frightened by noises or by the approach of any living thing that they consider an enemy. Your directions should include the following points:

a. In studying birds one should wear clothing of a dull color. Shades of brown which harmonize with the color of the ground and trunks of trees are the most desirable. White and bright colors which attract attention should not be worn.

b. One must move quietly and cautiously, taking the greatest care not to frighten the bird. In general, the bird can be approached more successfully if the observer pretends not to see it and appears to be in search of something else.

2. Insist upon careful observation and train pupils to describe only what they see. It is very easy to imagine that we see what we are looking for, even when it is invisible.

3. The opera glass is a convenience but not a necessity, but some work, such as Chapman and Reed's "Bird Guide" or Chapman's "Handbook of the Birds of Eastern North America" is indispensable. Two or three books of this type should be in every school library.

4. Pupils should carry pocket notebooks in which to record their observations on the spot. Otherwise some valuable points will be omitted.

Parts of a Bird. The diagram above shows the parts of the bird, with the names attached. Since the terms there used are found in all bird books, the pupils should become familiar with them, but with the young-

BIRDS

GENERAL

1. Birds usually live in pairs, rearing their young in homes which they make themselves.
2. All birds lay eggs from which young are hatched.
3. The young of the higher orders are naked when they break from the shell; some of the lower species are covered with hair or a full suit of feathers.
4. Some of the smallest birds, in their migrations, may cover in a single flight distances ranging from 500 to 2000 miles.

THE SEVEN ORDERS

Order	1. Raptores, Birds of Prey	2. Insessores, Perchers.	3. Scansores, Climbers.	4. Rasores, Scratchers.	5. Cursores, Runners.	6. Grallatores, Waders.	7. Natatores, Swimmers.
Members	Eagle, vulture, hawk, owl.	The most numerous. All singing birds.	Parrot, woodpecker, toucan.	Fowl, grouse, pheasant, pigeon.	Ostrich, emu, cassowary.	Crane, heron, snipe, sandpiper.	Duck, goose, gulls.

Peculiarities

1. Birds of Prey.
   a. The eagle. The noblest and most courageous of birds. Ascends higher than any other bird.
   b. Hawk. Fish hawk. Feeds on fish. Nests in high trees and cliffs.
   c. Vulture. Usually cowardly. Great powers of vision. Valuable scavengers. Gorge themselves eating.
2. Perchers. The most numerous group. Muscles so arranged as to prevent their falling while asleep. When sitting the toes are bent and cannot be opened until the bird rises.
3. Climbers. About 350 species.
   a. Parrot. Some known to live 90 years. South American parrot the talker.
   b. Woodpecker. Tongues long, slender, with a barbed horny tip. Tap trees for insects. The sapsucker bores holes around the tree.
   c. Toucan. Noted for its enormous bill. Live in flocks, one acts as watchman. Are easily tamed.
4. Scratchers. Cock and hen familiar examples.
   Grouse.
   Nests on the ground. The young leave the nest almost as soon as hatched.
   Pheasant. Not natives of United States. The common pheasant a native of Asia. Prized for their beauty.
5. Runners.
   a. Ostrich. Largest of birds. Male stands 7 or 8 feet. Timid bird. Has great speed. In captivity male and female sit upon the eggs in turn.
   b. Emu. Australian bird. Feet three-toed. Kicks with great force.
   c. Cassowary. Native of New Guinea. Stands five feet. Feathers like long hairs. Cannot fly, but a great runner.
6. Waders.
   a. Crane. Long neck and stilt-like legs. Lives in marshes. After eating stands on one foot dozing
   b. Heron. Lives in swamps and along shallow rivers. Found everywhere.
   c. Snipe. Narrow long bill, eyes set far back. Flies in a zigzag way when aroused.
   d. Sandpiper. About 30 species. Search mud for worms. Change their plumage with change of seasons.
7. Swimmers. Web-footed.
   a. Duck. Deep-sea duck dives to great depth for food.
   b. Goose. In the spring fly in V-shaped flocks. Return south as cold approaches.
   c. Gulls. Live along sea-coast and waters of the interior. Catch fish and follow ships, feeding on all kinds of flesh.

ORDERS OF BIRDS

Scratchers
1 and 2, Domestic Fowls.
3, Golden Pheasant.

Climbers
4, Woodpecker.
Birds of Prey
5, Eagle.

Perchers
6, Bobolink.
Runners
7, Ostrich.

Waders
8, Sandpiper.
9, Heron

Swimmers
10, Swan.
11, Domestic Duck

Additional Outline on Birds

I. General Description
- (1) Size and shape
- (2) Feathers
- (3) Flight
- (4) Endurance
- (5) Development of the senses

II. Anatomy
- (1) Skeleton
- (2) Muscular system
- (3) Organs of sense
- (4) Organs of circulation
- (5) Respiratory organs
- (6) Digestive organs

III. Classification
- (1) Birds of prey
  - (a) Buzzard
  - (b) Condor
  - (c) Eagle
  - (d) Falcon
  - (e) Hawk
  - (f) Kite
  - (g) Owl
  - (h) Vulture
- (2) Perchers
  - (a) Blackbird
  - (b) Crow
  - (c) Cuckoo
  - (d) Finch
  - (e) Paradise-bird
  - (f) Thrush
  - (g) Warbler
- (3) Climbers and creepers
  - (a) Parrot
  - (b) Woodpecker
  - (c) Toucan
  - (d) Wren
  - (e) Mouse-bird
  - (f) Trogon
- (4) Scratchers
  - (a) Bustard
  - (b) Grouse
  - (c) Pheasant
    - (1) True pheasants
    - (2) Turkey
    - (3) Chicken
- (5) Runners
  - (a) Apteryx
  - (b) Cassowary
  - (c) Emu
  - (d) Ostrich
  - (e) Roadrunner
- (6) Waders
  - (a) Crane
  - (b) Flamingo
  - (c) Heron
  - (d) Ibis
  - (e) Snipe
- (7) Swimmers
  - (a) Auk and Penguin
  - (b) Duck
  - (c) Goose
  - (d) Gull

IV. Birds' Eggs
- (1) Composition
- (2) Size
- (3) Shape
- (4) Color

V. Nests
- (1) Position
- (2) Shape
- (3) Material

VI. Special Characteristics
- (1) Migrations
- (2) Song
- (3) Brilliant plumage
- (4) Kinds of food
- (5) Mating
- (6) Care of the young

Questions on Birds

What characteristic distinguishes birds from other animals?

Name three kinds of birds already provided with feathers when they are hatched.

What advantage are feathers to these young birds?

How is the food of birds digested?

Can the birds that flit from bush to bush cover long distances in a single flight?

Why are the muscles which move the wings very strong?

Why do some of the bones contain air cavities?

Of what use is the tail in flying?

What is the wing? How is it formed?

What is remarkable about the eyes of a bird?

Which senses are the most acute? Which are dull?

What kinds of birds are the best singers?

Do both male and female generally sing?

er children, attention should be called to the most prominent parts only, as head, wings, tail, etc.

1. A live bird, a mounted specimen or the skin of the bird should be compared with the diagram and the children be asked to name the corresponding parts. Let the first lessons be on the parts most easily recognized, as the head, mandibles, wings, legs and tail. Measure the specimen from the point of the beak to the end of the tail.

How long is it?

Spread the wings and measure them from tip to tip. What is the distance?

How does this distance compare with the length?

2. Begin the second lesson with a review of the preceding one to make sure that the pupils remember what they observed. From the review proceed to a study of the more minute parts. Do this in a systematic manner. To illustrate: take first the parts of the body; head, nape, breast, beak and rump. When these parts have been learned, proceed in a like manner with the wings, tail and legs. Classes above the fifth grade should be able to distinguish and name all these parts, and an occasional exercise in connection with the other lessons will enable them to do so.

3. The adaptation of structure to the life of the bird is of special interest. Lead the older classes to see the difference in the beak of a bird of prey and that of one which feeds upon insects and fruit; also the difference in the foot of these birds. Figures 1–9 show the chief types represented in our common birds.

Figure 1, scratchers, such as the turkey, common fowl, grouse.

Figure 2, pigeon and doves.

Figures 3 and 4, birds of prey, such as the hawk, owl, buzzard.

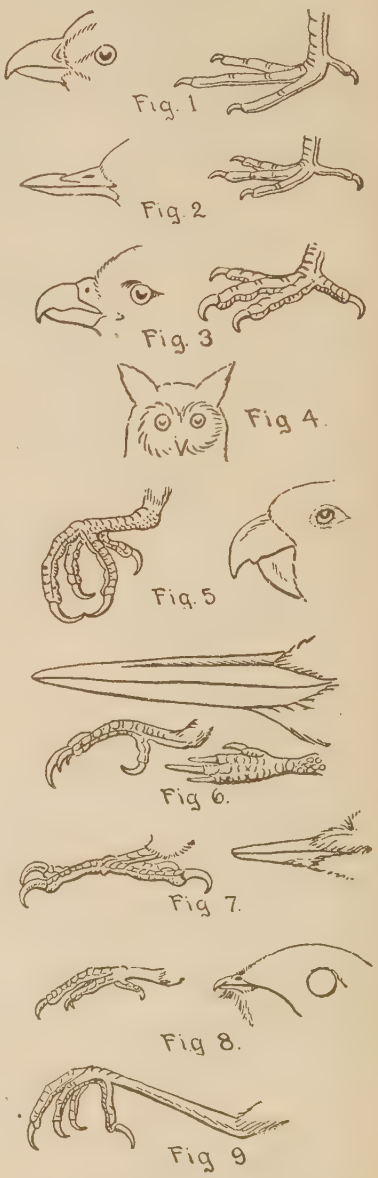
Figure 5, parrots.

Figure 6, cuckoos and kingfishers.

Figure 7, woodpeckers.

Figure 8, swifts and humming birds.

Figure 9, perching birds.



Protection of Birds. The chief purpose of these lessons should be to increase the children's interest in and love for birds, to impress upon them the value and importance of the birds to the farmer and gardener, and to enlist their services in protecting the birds and in inducing them to return to the same nesting places from year to year. The following are some of the means that can easily be employed to this end:

a. Encourage the children to feed the birds especially when they first return in the spring, and to provide them through the season with plenty of fresh water. A running fountain in the garden or yard, at which they can drink, is always a source of attraction to them. In nearly every locality there are birds which remain through the winter, and by feeding these regularly they are induced to remain about the buildings and yard and become quite familiar.

b. Provide nesting places. Any small structure which provides shelter from the sun and storms and is in a convenient place will attract the birds as a suitable place in which to build a nest. The illustration on next page shows a number of structures for bird houses, any one of which can easily be constructed by a boy who can use a hammer and saw.

c. Protecting young birds from cats and other enemies and also seeing that they are fed. Often young birds accidentally fall from their nests long before they are able to fly. In such cases it is wiser to return the bird to its nest, as it is so helpless that it needs the care of its parents. Many of these birds, too, are practically helpless when they first leave the nest, and in this condition easily fall a prey to cats or other animals which feed upon them. These young birds have not learned to feed themselves when they leave the nest, and unless fed by the parents, many of them perish from starvation. If the young bird found in this condition is approached carefully and fed, it is at once

BIRD HOUSES

tamed, but if frightened at the first approach of the children, it is probable that it can never be tamed. Older birds with a broken wing or leg are sometimes found by children. The broken member should be bound tightly so that it will heal in position, and the bird should be protected from cats and other enemies until it is strong enough to fly away. No better work to give children practice in patience and gentleness can be found than that of looking after and caring for these helpless fledglings. In this there is also opportunity for study.

Bird Reservations are tracts of land, particularly islands and marshy reaches along rivers and shores, set aside by the government as retreats for native wild birds, where they can nest in safety, secure from the depredations of hunters. The first reservation in the United States was established by President Roosevelt in 1910, when he set aside Pelican Island, Indian River, Fla., as a home for the pelicans that nested there. When he retired from office fifty-three reservations had been established, and since then several others have been organized—four in 1913, two in 1915 and one in 1916. They are located in all parts of the American domain, from Porto Rico on the south and east to Alaska on the north, along the Gulf and Atlantic shores, midland in Nebraska and South Dakota, westward in Oregon; while in mid-Pacific is the Hawaiian Island Reservation, the largest of America's bird sanctuaries.

Bird Laws. For a number of years laws in opposition to the indiscriminate hunting of birds have been passed by state and provincial legislatures. Such legislation is based on economic grounds, with reference to the benefit to agriculture of insect-eating birds, and on sentimental grounds. It is rightly felt that the birds, with their beautiful coloring and sweet voices, add too much to the joy of life to be ruthlessly slaughtered for the game market, for sport or for the millinery trade. The McLean Act of 1913 gives the United States government control of all migratory and game birds that do not remain permanently within the boundaries of one state, and the Department of Agriculture is given the power to issue rules in regard to closed seasons, bird zones, etc. In 1915 about 240 state laws regarding bird protection were passed. The Underwood Tariff Law of 1913 had a provision prohibiting the importation of bird skins or feathers into the United States, and in 1915 a similar law went into effect in Canada. In 1916 a treaty was ratified by the United States and Canada providing for the protection of insect-feeding and game birds flying from the United States into Canada.

Bird Day, a day set apart in Canada and the United States for special exercises in the schools. Its object is to teach the pupils the importance of protecting the birds. Bird Day was first observed in the public schools of Oil City, Pa., May, 1894. A circular on the subject of bird protection was issued two years later by the United States Department of Agriculture. No special date has been chosen, but the schools in any locality are urged to select a day suitable for that region.

Wonder Questions About Birds

Why do some birds wear brilliant plumage and others sober colors?

Coloration among birds usually bears an important relation to their habits and mode of life. Certain birds which nest on the ground and are preyed upon by various enemies have plumage which so blends with the background of weeds and grasses that the birds are rendered inconspicuous. This is an example of protective coloration, or natural "camouflage." Some of the plovers and sandpipers wear such a plumage during the summer months, and in winter change it for a garment that blends with the shores and beaches. Tanagers, toucans, parrots and many other brilliantly-colored birds which live in trees are less exposed to danger than ground-nesting birds, and it is supposed that the former rely on their native haunts for protection. There is another theory that some naturalists accept. It has been noticed that the males of many species which have bright plumage are poor singers, while many dull colored birds are famous songsters. From this it is argued that the soberly-clad male woos his mate by his sweet singing, while his more handsome brother relies on his gay feathers. This is a subject that ought to prove of special interest to those who enjoy bird study and observation.

Why do birds eat so much?

Did you ever try to feed a family of orphan baby robins? One bird lover who did so reported that each bird ate forty-one per cent more than its own weight in twelve hours. At this rate man would eat about seventy pounds of flesh a day, and drink five or six gallons of water. Anyone who has observed birds to any extent will agree that they seem to be eating all day long. The reason for this is that they are exceedingly active and very warm blooded, and they need an extraordinary amount of food to sustain their high temperature and bodily activity. Nature has made incessant eating possible for them by giving them adequate digestive powers. The reports of various naturalists show that the voracious appetites of birds have a distinct economic value. In the stomach of a single cedar waxwing were found one hundred canker worms; a scarlet tanager was observed to devour 630 gypsy moth caterpillars in eighteen minutes; a Maryland yellow-throat ate plant lice at the rate of over 5,000 an hour. Birds also devour weed seeds, field mice and refuse. It is evident then that the help they give the agriculturist far offsets the damage they may do to fruit and grain crops.

How can birds hear, when they have no ears?

Birds have no visible ears, but they possess an internal apparatus that enables them to hear acutely. Robins seem to listen for the sounds made by crawling worms, and woodpeckers can detect by sound the presence of the grubs of boring snails. A word uttered in a low voice or the crackling of a twig will throw a whole flock of birds into an uproar. The tufts of feathers on the heads of such birds as the screech owl are not ears, though they are sometimes mistaken for organs of hearing. It is interesting to know that birds not only hear acutely, but they can distinguish between different tones and pitches.

Do birds talk to one another?

There is no doubt but that birds communicate with one another through various kinds of notes. Numerous species have a special call note which summons the individuals to form into a flock, and when flocks are making their way to another climate, the call note is sounded again and again to keep the line unbroken. Calls of alarm and of hunger are uttered by young birds of a number of species. Some birds are able to convey to their young, by means of certain notes, the fact of threatening danger and a warning to keep very quiet. This gift of language is more highly developed in some species than in others. The crows and jays, for example, have a really extended vocabulary, while the cormorants and water turkeys make only a few elementary sounds. In the case of the former there is a regular development of the range of notes from the nesting period to maturity.

How do birds find their way back home when they are thousands of miles away?

There is evidently some special faculty that directs birds over vast stretches of land and water, and causes them to return to the same yard or even the same tree on almost the same date, year after year. It is true that they make use of sight, hearing, memory and the power of association, but this summary does not tell the whole story. Undoubtedly birds possess in a marked degree what we may call a sense of direction. This instinct keeps them on the straight route in the darkness of night and where familiar landmarks are lacking. Homing or carrier pigeons have this sixth sense developed to a remarkable degree.

What repulsive animals were the birds' first ancestors?

Strange as it may seem, the beloved songsters of our woods are descendants of the reptilian class, to which belong the most hated of all animals. Ages ago there existed reptiles which could fly, and the first bird had reptilelike claws, toothed jaws and a long, lizardlike tail. Its front limbs, however, were adapted for flying, and the animal was covered with feathers. Modern birds and modern reptiles have many points in common in respect to structure. But how far apart they are in the affection they awaken in human hearts!

How fast do young birds grow?

They grow at a rate quite out of proportion to their size. One naturalist tells of a cedar waxwing that doubled its weight the first day, trebled it on the second, and almost quadrupled it on the third. On the twelfth day, when it left the nest, it had increased its weight thirteen-fold. He adds, "At a corresponding rate of growth, a ten-pound baby would weigh 134 pounds at the age of twelve days." This astonishing rate of growth keeps the parents constantly occupied to find food to satisfy the increasing appetite.

Do birds use their wings for anything besides flying?

Yes, the wings of birds serve a variety of purposes. Penguins, Arctic birds that find it easier to swim than to fly, use their short wings in the water as oars; on land, the wings serve as forefeet when the penguins crawl on the ground. The young of numerous birds are gathered under the parents' wings when the little ones need shelter or protection, and frequently the mother bird spreads her wings over the nest to guard the eggs. Fighting birds, including aggressive domestic poultry, find the wings a strong weapon of attack. Birds also give vent to various emotions by flapping, spreading and fluttering the wings. Everyone, too, is familiar with the bird's habit of tucking its head under its wings when it goes to sleep.

How high in the air do migrating birds fly?

The height at which birds travel at such times varies from a few yards to nearly three miles. We know that the calls of traveling birds may be frequently heard at night, and that in the daytime migrating flocks are often visible, so it is reasonable to suppose that a good many birds seek only moderate altitudes. Another evidence of this is the large number of birds that are killed at night through striking against obstacles. On the other hand, observers who have watched migrations through telescopes report that numerous birds fly so high one cannot discern them with the naked eye.

Do birds put away stores of food like the squirrels?

No, birds very rarely store up supplies for the future. In fact, they seem to spend most of their time searching for food to satisfy present demands. In tropical regions food is abundant the year round, and there is no occasion for storing it up; in less favored localities the bird inhabitants leave when the food supply gives out, and migrate to warmer climes.

Why do birds return to their northern homes in the spring?

One might think that the birds would prefer to remain in the sunny Southland all the year round, where the food supply is never endangered by ice and snow. We must remember, however, that if all the birds built nests and reared their families in the same part of the world the warm regions would be so thickly populated with birds that even there the food supply would run short. And, just as human beings emigrate from crowded countries to new and unsettled lands, so birds keep the southern regions from becoming overcrowded by their yearly journeys northward.

How do birds keep their balance when on the wing?

Birds have a special organ of balance which keeps them from falling over when they are flying. This organ consists of semicircular canals in the head; the canals are filled with a fluid that communicates with delicate nerve fibers, and the fibers are the ends of a nerve of balance. Human beings have a similar organ in the head, and when it is not acting normally they may lose their equilibrium. In birds the organ of balance is highly developed.

How does it happen that some birds, such as the ostrich and emu, cannot fly?

It is probable that the flightless birds of today are the descendants of birds which originally could fly, but lost that power through not exercising it. Birds which had to escape from swift, powerful enemies developed great powers of flight, while others had no need to exercise their wings. In course of time the wings lost the power of carrying the birds in the air, and the latter became flightless.

In some cases the programs for Bird Day and Arbor Day are combined.

Bird Books. Recent years have seen the publication of a large number of very interesting books on the subject of birds, some of them dealing principally with their habits and manner of life, while others give simple descriptions of the birds in such a way that a person may name them on sight. Not a few of these books are beautifully illustrated with colored pictures, which show vividly the striking characteristics of the birds. Besides the local books which deal with the birds of the regions around large cities or in certain restricted localities, there are such general books as Frank M. Chapman's *Color Key to North American Birds* and *Birds of the Eastern United States,* which are excellent for beginners in bird study. Olive Thorne Miller's *Bird Ways, In Nesting Time* and *Our Home Pets,* Mabel Osgood Wright's *Bird Craft* and *Citizen Birds,* are books of a different type that are charming reading, whether one studies the birds in the field or not.

Related Articles. Consult the following titles for additional information:

BIRDS OF PREY

Buzzard	Kestrel	Secretary Bird
Condor	Kite	Shrike
Eagle	Lammergeier	Turkey
Falcon	Marsh Hawk	Buzzard
Goshawk	Owl	Vulture
Hawk		

CREEPERS AND CLIMBERS

Cockatoo	Macaw	Toucan
Creeper	Parrakeet	Woodpecker
Flicker	Parrot	Wren
Lory	Quetzel	Wryneck

FISHING BIRDS

Booby	Darter	Frigate Bird
Cormorant	Fish Hawk	Pelican

PERCHERS

American Goldfinch	Curassow	Oriole
	Dickcissel	Ortolan
Baltimore Oriole	Dippel	Oven Bird
	Finch	Pipit
Bellbird	Flycatcher	Raven
Bird of Paradise	Goldfinch	Redstart
	Grackle	Robin
Blackbird	Grosbeak	Rook
Bluebird	Halcyon	Snowbird
Bobolink	Hoopoe	Sparrow
Bower-bird	Indigo Bird	Starling
Brown Thrasher	Jackdaw	Stone Chat
	Jay	Sunbird
Bullfinch	Junco	Swallow
Bunting	Kingfisher	Tailor Bird
Canary	Kinglet	Tanager
Cardinal Bird	Lark	Thrush
Catbird	Linnet	Titmouse
Chaffinch	Magpie	Umbrella Bird
Chat	Martin	Vireo
Cowbird	Meadow Lark	Wagtail
Crossbill	Mocking Bird	Warbler
Crow	Nightingale	Waxwing
Crow Blackbird	Nutcracker	Weaver Bird
Cuckoo	Nuthatch	Wood Pewee

PIGEONS

Carrier Pigeon	Pigeon
Dove	Turtle Dove
Passenger Pigeon	

RUNNERS

Apteryx	Emu	Rhea
Cassowary	Ostrich	Road Runner

SCRATCHERS

Bustard	Lyre Bird	Prairie Chicken
Grouse	Mound Bird	Ptarmigan
Guan	Partridge	Quail
Guinea Fowl	Peacock	Tragopan
Jungle Fowl	Pheasant	Turkey

SEA BIRDS

Albatross	Gull	Scissorsbill
Fulmar	Kittiwake	Tern
Gannet	Petrel	Tropic Bird

SWIMMERS

Auk	Duck	Merganser
Brant Goose	Eider Duck	Penguin
Canada Goose	Gadwall	Puffin
Canvasback	Gallinule	Shoveler
Coot	Goose	Swan
Diver	Grebe	Widgeon

WADERS

Adjutant	Jabiru	Sandpiper
Avocet	Jacana	Snipe
Bittern	Lapwing	Spoonbill
Crane	Night Heron	Stilt
Curlew	Oyster Catcher	Stork
Egret	Plover	Turnstone
Flamingo	Rail	Woodcock
Heron	Ruff	Yellowlegs
Ibis	Sanderling	

WEAK-FOOTED BIRDS

Goatsucker	Swift
Humming Bird	Whip-poor-will
Night Hawk	

MISCELLANEOUS TOPICS

Aviary	
Egg	Nature Study
Migration of Animals	Nest

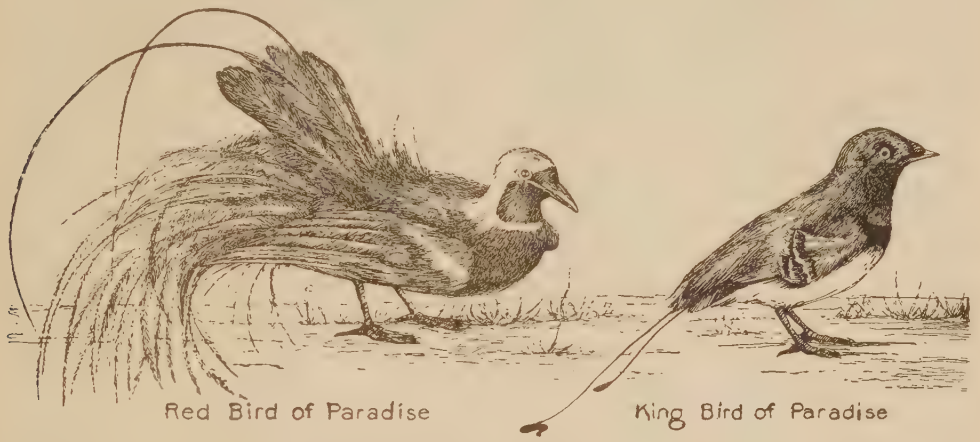
BIRDS' EYE MAPLE. See MAPLE.

BIRDS' NESTS. See NEST.

BIRDS OF PAR'ADISE, the familiar name for a family of birds noted everywhere for the splendor of their plumage. About forty species live in Australia, New Guinea and the other islands of the Pacific. They live almost entirely in the tree tops, eating seeds, fruits and insects and building their rather flimsy nests. In all species the plumage of the male especially is brilliant and velvety, but it is not alone in brilliancy of color that the birds of paradise are remarkable. The males have wonderfully long and graceful plumes, which in some species grow from the shoulders, in others from the tail or from the head. In one species the shoulder tufts are so long and fine that they fall far below the body, and even below the tail, in a showery mass of brilliantly colored, delicate, threadlike feathers. The plumes of the tail in one species are long, slender quills which on the very tip bear a small rounded vane.

It is difficult to describe the varieties in feathers or the tints and shades of color to be found, even on a single bird, and it is quite impossible to give any idea of the varied and brilliant family. The smallest are about the size of the sparrow, and the

largest are nearly as big as a crow. The males often gather together in some tree and give peculiar dances, fluttering their gorgeous plumes to attract their mates. It is at this time, when the birds are excited by their performances, that the native hunters kill them for the market. A humanitarian movement to restrict the slaughter of these lovely creatures is spreading throughout the world, and the importation of their plumage, or that of any other wild birds, into Canada and the United States is forbidden.



Red Bird of Paradise King Bird of Paradise

BIRDS OF PREY, a class of carniverous (flesh-eating) birds, so called because they obtain their food by chasing and capturing other animals. As a rule the birds of prey are powerful flyers, and are provided with strong, sharp beaks and catlike claws. Among the typical members of this group are the eagles, vultures, fishhawks, falcons and owls; all are described in these volumes.

BIR'KENHEAD, ENGLAND, an important city on the Mersey River, opposite Liverpool. It has great docks covering 165 acres and some of the world's largest floating docks. The town owes the beginning of its growth to Messrs. Lairds' shipbuilding yards, which constructed the famous *Alabama* (which see) for the Confederate States of America. In connection with the present shipyards are the great Britannia machinery works. The public utilities—street cars, ferries to Liverpool, gas and electric lighting and waterworks—are owned by the city; the two first named are leased to operating companies. Population, 1911, 130,832.

BIR'MINGHAM, ALA., founded in 1871 by the Elyton Land Company, is the county seat of Jefferson County and the largest city of the state, nearly as large as the next seven cities combined. The growth of Birmingham has been rapid, and is due to the great iron and coal industries which center there. It is nearly 100 miles northwest to Montgomery, and has nine lines of railroad—the Central of Georgia, the Louisville & Nashville, the Mobile & Ohio, the Seaboard Air Line, the Atlanta, Birmingham & Atlantic, the Southern, the Frisco, the Illinois Central and the Alabama Great Southern. There are also many interurban lines.

Industries. There are three famous coal fields near Birmingham, the Coosa, the Warrior and the Cahaba. Red Mountain, running parallel with Jones valley, in which the city is located, is a great mass of hematite, a red, fossiliferous ore of iron. The great coal center in Pennsylvania extends directly southwest into Alabama and there expands; Birmingham is in the center of the Alabama field. Besides, there are immense deposits of limestone. The continued importance, rapid growth and prosperity of the city seem therefore assured.

The industries connected with iron, coal and limestone dominate business life; more than half of the country's export of pig iron is from the Birmingham district. There are also important cotton interests; the city is a great yellow-pine market; and there is large production of fertilizer, cement and clay products, the city and neighborhood possessing valuable clay beds. The improvement of the Warrior River, now in progress, and the projected canal from the city to the river, sixteen miles distant, will give Birmingham direct water transportation to the Gulf.

Buildings. There are several buildings from ten to twenty-five stories in height. The Federal building represents an expenditure of $2,000,000; there is a terminal station valued at $2,000,000, two hotels costing not far from $1,000,000 each, and the city has Saint Vincent's Hospital, Hillman's Hospital, Jefferson County almshouse and Mercy Home. Within the limits of the city are located Howard College (Baptist) and Birmingham College (Methodist). The people of the city have voted three million dollars in bonds for the erection of new public school buildings; when this program is completed, the schools of the city will be the best equipped in the South.

Greater Birmingham. In 1910 a law became effective which materially extended the city limits. The suburbs of North Birmingham, Avondale, East Lake, Woodlawn, Wylam, Pratt City, Elyton, Ensley, West End and East Birmingham were added to the city, which is under the commission form of government, with five commissioners elected by the people. Population, 1910, 132,685; in 1917, 189,716 (Federal estimate). Including its suburbs, the population of the city is estimated at 225,000.

BIRMINGHAM, ENGLAND, one of the most important cities of the United Kingdom, situated between London and Liverpool, 103 miles northwest of the former city and seventy-eight miles southeast of the latter. It is England's chief manufacturing city, the industries representing many lines of commerce, but particularly iron, steel and brass products. Among the leading manufactures are engines, motors, railway cars, guns and machinery of all kinds. During the World War the making of munitions became the business of nearly 200,000 people.

Schools for higher education are numerous, and there are several strong technical schools. In connection with a great art school there is a large art gallery, open to the public. The city owns the street railways, and they are operated under lease. To within about fifty years Birmingham was unsanitary, but such conditions as then existed among the toilers have been vastly improved. Only three English cities—London, Liverpool and Manchester—are larger. Population, 1911, 523,833.

BIR'NAM WOOD, a hill in Perthshire, Scotland, formerly covered with trees, and memorable because of its association with Shakespeare's *Macbeth*. In that play Macbeth is told that he will never be defeated until Birnam Wood shall come to Dunsinane. His enemies covered themselves with boughs and marched from the hill, thus making it seem that the wood did actually move. The hill has been stripped of its trees since Shakespeare's time. It is 1,324 feet high, and is twelve miles northwest of Perth, overlooking the valley of the Tay.

BIR'NEY, JAMES GILLESPIE (1792–1857), an American reformer, born in Danville, Ky. He was graduated at Princeton in 1810, studied law and began practice in Danville in 1814. He soon removed to Alabama and served in the legislature of that state, but gradually turned his attention to the study of the slavery question and became the leader of the conservative wing of the Abolitionists. In 1833 he returned to Danville, freed his own slaves and from that time forward devoted himself to the cause of gradual emancipation. He organized the Kentucky Anti-slavery Society in 1835, and in the following year moved to Cincinnati and issued the first number of an anti-slavery paper. During the next few years he often suffered from the violence of mobs. In 1840 and again in 1844 he was the candidate of the Liberty party for the Presidency, but received few votes. The last twelve years of his life he was an invalid.

BIRTH REGISTRATION, or the recording of births, has for centuries been compulsory in Europe. Though most of the states of the American Union have laws requiring that every birth be registered, these laws have not been faithfully administered except in New England, Pennsylvania and Michigan. With the organization of the Children's Bureau in 1912 a decided impetus was given to the movement for registering births. It was pointed out that satisfactory statistics of infant mortality, serving as a guide to health conditions, cannot be obtained without a well-organized system of registration; laxity in recording births also interferes with the proper administration of child-labor laws.

The infant welfare movement, of which birth registration is a part, also received special attention after the entrance of America into the World War, for the number of men rejected for physical reasons by the exemption boards emphasized the need of improving health conditions in early life. It is

expected that the state legislatures will enact uniform laws putting birth registration on a thoroughly satisfactory basis throughout the Union.

In Canada the registration of births is under provincial control, and each province has its own method of administering the recording of births.

BIRTHSTONES, precious stones which have been sentimentally associated with the months. Each stone in the group is the birthstone of the persons who were born in the month with which the particular gem is connected. The custom of thus assigning certain stones to certain months may have some connection with the twelve stones of the high priest's breastplate (see *Exodus* XVIII, 15–20), but the actual practice of wearing birthstones began in Poland in the eighteenth century. Below is the list of birthstones adopted in 1913 by the American National Retail Jewelers' Association:

January	Garnet
February	Amethyst
March	Bloodstone or aquamarine
April	Diamond
May	Emerald
June	Pearl or moonstone
July	Ruby
August	Sardonyx or peridot
September	Sapphire
October	Opal or tourmaline
November	Topaz
December	Turquoise or lapis-lazuli

BISBEE, *biz'bee*, ARIZ., founded in 1877 and in 1919 the third city in size in the state, is located in Cochise County, eight miles from the Mexican border and 252 miles west of El Paso, Tex. It is in a copper-mining district, and 5,000 miners are employed in the vicinity. The El Paso & Southwestern Railroad serves the city. There is a public library, a Y. M. C. A., a Y. W. C. A. and an Elks' Club. Population, 1910, 9,016.

BISCAY, *bis'kay*, BAY OF, a great indentation of the Atlantic Ocean which lies between the projecting coasts of France and Spain, and extends from the French island of Ushant to Cape Ortegal. The length and breadth are about 400 miles. It receives the rivers Loire, Charente, Adour and Gironde. The principal ports on the bay are Nantes, Bordeaux, Bayonne, San Sebastian and Gijon. The tides here are among the highest known, and navigation is very difficult.

BISHOP, *bish'up*, the title of an overseer or superintendent over a number of local churches, which constitute his diocese. The Anglican, Roman Catholic, Greek and some other Eastern churches consider the office of bishop to have descended in an unbroken line from the twelve apostles. Most Protestant denominations, however, do not accept this order of succession. The Methodist Episcopal Church recognizes the authority of a bishop, but not an ecclesiastical supremacy. In this church the office is elective, and bishops are placed upon the retired list by vote of the general conference. The duties of the bishop vary with different denominations. In general, the bishop has oversight over the clergy and various church interests within his diocese. He may call conventions of the clergy, at which he presides, appoint clergymen to churches and for cause may remove them from their positions.

BISMARCK, *biz'mark*, N. D., the fourth city in size in the state, the state capital, and the county seat of Burleigh County. Fargo is 194 miles east. It is on the Northern Pacific and the Minneapolis, Saint Paul & Sault Ste. Marie railroads; the Chicago, Milwaukee & Saint Paul acquired terminal rights in 1910. The city is also on the Missouri River, and there is river commerce as far as Fort Benton, Mont., 1,500 miles up the stream. There are numerous buildings of prominence; among them are a Methodist college, two hospitals, a large hotel, the state capitol (costing $500,000), an auditorium, an armory, a library and a Masonic Temple. Four miles from the city is Fort Lincoln, a military post.

The industries are largely connected with agriculture. There are flour and feed mills, grain elevators, several agricultural implement assembly plants, a twine plant, and the promise of important development of flax mills.

Bismarck was founded May 14, 1872, and named for the Chancellor of the German Empire; in 1883 it became the territorial capital, and in 1889 was made the capital of the new state of North Dakota. The state industrial exposition is held here every autumn. The commission form of government was adopted in 1912. Population, 1910, 5,493; in 1919, 7,250 (estimated).

BISMARCK ARCHIPELAGO, *biz'mark ahr ki pel'a go*, a group of islands inhabited chiefly by Papuans, containing an area of 20,000 square miles belonging to Germany between 1885 and 1915. In the latter year, during the World War, they were taken by Australian troops and held for the British

Empire until the issues of the war should be determined. The chief products are copra, coffee and rubber. The group was named in honor of the former German Chancellor.

BISMARCK-SCHONHAUSEN, *bis'mahrk shön'how zen*, KARL OTTO EDUARD LEOPOLD VON, Prince (1815–1898), a German statesman to whose genius is due the founding of the German Empire. He was born at Schönhausen, of a noble family, studied at Göttingen and Berlin and entered the army.

After a brief interval devoted to his estates and to the office of inspector of dikes, he became in 1846 a member of the provincial diet of Saxony, and in 1847 of the Prussian diet. In 1851 he was appointed representative of Prussia in the diet of the German Federation at Frankfort, where with brief interruptions he remained till 1859, exhibiting the highest ability in his efforts to checkmate Austria and place Prussia at the head of the German states. From 1859 to 1862 he was Ambassador to Saint Petersburg, and in the latter year, after an embassy to Paris of five months' duration, he was appointed minister of foreign affairs and president of the Prussian cabinet. The Lower House presistently refusing to pass the bill for the reorganization of the army, Bismark at once dissolved the diet, closing it for four successive sessions until the work of reorganization was complete.

PRINCE VON BISMARCK

When popular feeling had reached its most strained point, the Schleswig-Holstein question acted as a diversion, and Bismarck, by the skilful manner in which he added the duchies to Prussian territory, checkmated Austria and excluded it from the new German Confederation, became the most popular man in Germany. Prussia now held the chief place in Germany, and as a result a struggle between Germany and France appeared to be sooner or later inevitable. Bismarck, having made full preparations, brought matters to a head on the question of the Hohenzollern candidature for the Spanish throne, and the result was the Franco-German War.

After the successful issue of the war, Bismarck became Chancellor of the new German Empire, with the title of prince. He formed with Austria and Italy the Triple Alliance, not, he said, with the intention of entering upon further war, but for purposes of defense. Subsequently he alienated the Roman Catholic party by his opposition to the doctrine of the Pope's infallibility, and was for a long time involved in a conflict with the Church. He held his position of Chancellor until March, 1890, when he disagreed with Emperor William II and tendered his resignation.

Related Articles. Consult the following titles for additional information:
Franco-German War
Germany
Prussia
Schleswig-Holstein
Seven Weeks' War
Triple Alliance

BISMUTH, *biz'muth*, a metal of a grayish-white color, slightly tinted with red, used in making pewter and printers' types and in various other metallic mixtures. It is somewhat harder than lead and cannot be worked with a hammer when cold, being so brittle as to break easily into powder. Its internal face or fracture exhibits large shining plates variously disposed. It fuses at 476° F. and expands considerably as it hardens. It is often found in a native state, crystallized in eight-sided forms, or in the form of thin plates in the ores of other metals, particularly cobalt. Eight parts of bismuth, five of lead and three of tin constitute the fusible metal sometimes called Newton's, which melts at 202° F., and may be fused over a candle in a piece of stiff paper without burning the paper. Bismuth forms the basis of a sympathetic ink. The nitrate of bismuth is used as a medicine, while the oxychloride is used as a paint and as a cosmetic, under the name of *pearl-white* or *pearl-powder*.

BISON. See BUFFALO.

BITHYNIA, *bith in'i a*, an ancient country of Asia Minor, stretching along about one-half of the south shore of the Black Sea. It was settled by adventurers from Thrace, and was conquered by King Croesus of Lydia. Later it fell to the Persians, and afterward it was subdued by Alexander the Great. The Bithynian kingdom was founded by Nicomedes I about 278 B. C. and remained independent until 74 B. C. when Nicomedes III ceded it to the Romans, who placed Pliny the Younger as ruler over it. Its chief cities were Chalcedon, Heraclea, Nicaea, Nicomedia and Brusa. In 1298 the Turks broke into the country and conquered it. Brusa was for some time thereafter a

Turkish capital. It now contains no town of importance.

BIT'TER-ASH. See QUASSIA.

BITTERN, the name of several wading birds of the heron family. The common bittern of the United States is a dull yellowish-brown, with spots and bars of black or dark brown. It has a short tail and long and loose breast feathers. It is remarkable for its curious booming or bellowing cry. It has a great variety of common names, such as miredrum, fly-up-the-creek and stake driver. If wounded the bird fights vigorously. Although it is a harmless and night-hunting bird that lives upon the small animals of the swamps, its peculiar habits and gloomy cry render it unpopular.

AMERICAN BITTERN

BIT'TERNUT, the swamp hickory, a tree of North America which bears small and somewhat egg-shaped fruits, with a thin, fleshy rind; the kernel is bitter and unpleasant. See HICKORY.

BIT'TERROOT, a plant of Canada and Northwestern United States, so called from its edible root, which is esteemed as a delicacy by whites as well as Indians. From its tobaccolike odor while cooking, it is called *tobacco root.* From the root, which is long, fleshy and tapering, grow clusters of juicy green leaves, with a fleshy stalk bearing a handsome, solitary, rose-colored flower, rising in the center and remaining open only in sunshine. Bitterroot is the state flower of Montana.

BITU'MEN, a mineral substance composed principally of hydrogen and carbon, and appearing in a variety of forms, which pass into one another and are known by different names. They range from *naphtha,* the most fluid, to *petroleum* and *mineral tar,* which are less so, thence to *maltha* or *mineral pitch,* which is more or less cohesive, and lastly to *asphalt* and *elastic bitumen,* which are solid. Bitumen is found in the earth, and burns like pitch, with much smoke and flame. It is a very widely spread mineral, and it now largely employed in various ways. As the binding substance in mastics and cements it is used for making roofs, arches, walls and cellar floors watertight, and for street and other pavements. It is also used, in some of its forms, for fuel and for illuminating purposes. The bricks of which the walls of Babylon were built are said to have been cemented with bitumen, which gave them unusual solidity. See ASPHALT; COAL, subhead *Bituminous Coal.*

BITUMINOUS SHALE, or **SCHIST,** *shist,* a clay shale impregnated with bitumen and very common in the coal measures. Much of this rock contains so much coal and bitumen that it is used for fuel. See COAL.

BIZET, *be za',* ALEXANDER CESAR LEOPOLD (1838–1875), a French composer, chiefly known for his light opera, *Carmen,* considered one of the best of its kind. He showed remarkable musical genius at an early age, and while studying in Italy received many prizes for compositions. Returning to France, he adopted the methods of the extreme romantic school, but his work was not warmly received and as a last resort he wrote *Carmen.* This was a failure at first, but it soon won recognition, though Bizet died before its success was assured.

BJORNSON, *byorn'son,* BJORNSTJERNE (1832–1910), a Norwegian novelist, poet and dramatist, whose fame rests chiefly on his stories of Norwegian peasant life. He was educated at the University of Christiania and shortly after leaving the university became known as a contributor of articles and stories to newspapers, and as a dramatic critic. From 1857 to 1859 he was manager of the Bergen theater, and he produced during that time his novels *Synnove Solbakken* and *Arne,* and his first drama, *Between the Battles.* He was editor or associate editor of several periodicals, traveled and lectured in the United States and spent considerable time abroad. In spite of this last fact, however, he was intensely national, and he was the leader of the Norwegians in many popular movements. In 1903 he received the Nobel prize for literature.

Among his tales and novels, besides those mentioned above, are *The Fishermaiden, A Happy Boy, The Bridal March, Dust and In*

God's Way; while among his dramas are *The Newly Married Couple, Mary Stuart in Scotland, A Bankruptcy, The King* and *A Glove.* A popular poem for children, *The Tree,* will be found in the article LANGUAGE AND GRAMMAR, in the section on first-year work.

BLACK, in popular speech the darkest of all colors, but theoretically a hue representing the absence of color (see COLOR). According to the spectrum theory the colors of the rainbow when combined form white; any object which reflects all of these colors is white, and one which absorbs them all is black. In reality a black object is one which reflects the smallest proportion, since total absorption is possible only in theory.

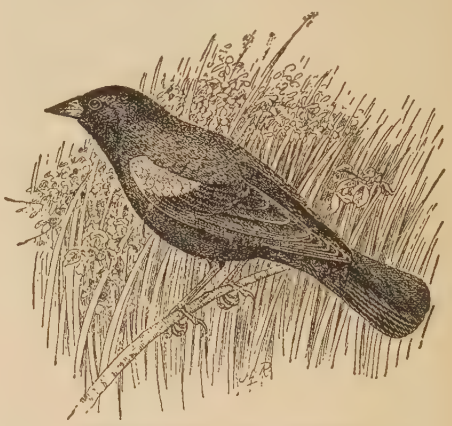
BLACK, WILLIAM (1841–1898), a Scottish novelist, born in Glasgow. His first novel, *Love or Marriage,* was moderately successful, but *In Silk Attire. Kilmeny* and, especially, *A Daughter of Heth,* gained him an increasingly wide circle of readers. Among his later works are *The Strange Adventures of a Phaeton, A Princess of Thule, Green Pastures and Piccadilly, Macleod of Dare, White Wings, Judith Shakespeare, Madcap Violet* and *In Far Lochaber.* Black is decidedly at his best when dealing with the Scotch Highlands, where most of his scenes are laid.

BLACK ART. See NECROMANCY.

BLACKBERRY, so called from its luscious black, seedy fruit, is a thorny shrub which grows on well-drained soil in nearly all localities where small fruits thrive. The berries are prized for jams, jellies, wines and preserves, and for dessert. The spring blossoms are pinkish or white; the ripe berry is a collection of numerous purplish black parts arranged around a concealed white center at the end of the stem.

White Blackberries. In 1880 Luther Burbank (which see) began a series of experiments in crossing blackberries. In four years he had sixty hybrids, the first ever produced. From hybrid seeds of the third generation he grew black, red, and yellow raspberries, white, black, red, and pink blackberries, widely varying in sizes, flavors and qualities. One of the most interesting specimens of berries is the white blackberry, a hybrid with abundant clusters of most delicious fruit, perfectly white in color. He found in the eastern states a bramble with an insignificant variety of small, whitish berries; he secured some of these, introduced the type into his blackberry culture, and the result was a combination of the white color with the excellent qualities of the other parent.

BLACK'BIRD, a group of North American birds, so called because of the jet black plumage of the males. The females, however, are brownish, commonplace birds. The *red-winged blackbird* is a handsome inhabitant of the marshes, that wears a bright scar-



RED-WINGED BLACKBIRD

let epaulette on each shoulder; it is also called *swamp blackbird.* In the West Central states is another handsome species, whose head and neck are a bright yellow or orange.

In Europe the name is applied to the merle, a well-known thrush which has a rich, mellow and flutelike song. See COWBIRD; CROW BLACKBIRD; GRACKLE.

BLACKBURN, ENGLAND, an important manufacturing city, twenty-one miles northwest of Manchester. It dates from the early modern period; Queen Elizabeth founded a grammar school here in 1557. To-day Blackburn owns its public utilities, but leases them to private companies for operation; has very important manufactures of cotton goods, cotton-weaving machinery and iron products. It was from Blackburn, his native city, that James Hargreaves (which see) was driven when he invented the spinning jenny. The city was incorporated in 1851. Population, 1911, 133,064.

BLACK DEATH, a name given an Oriental plague that in times past has caused the loss of countless lives in the eastern hemisphere. See PLAGUE.

BLACK-EYED SUSAN, a popular wild flower with orange-yellow petals and a con-

spicuous purple-black center. The flower stems and leaves of the plant are rough and hairy, and each stem is topped by a single blossom. Black-eyed Susans are attractive garden flowers and are easily cultivated.

BLACKFISH, or **TAUTOG**, *taw tog'*, a fish caught on the coasts of both Atlantic and Pacific oceans. Its back and sides are of a bluish or crow black; the under parts, especially in the males, are white. It is plump in appearance, and much esteemed for the table, varying in size from two to twelve pounds.

BLACKFOOT, more properly the SIKSIKA, a tribe of American Indians. The origin of the name is in doubt, but it is believed to be derived from the discoloration of their footwear by the ashes of prairie fires. In 1790 they numbered about 9,000 members; in 1910 they were reduced to 4,635. Of these 795 were in the Blackfoot Agency, Alberta; 1,174 were in the Blood Agency, Alberta; 471 were in Piegan Agency, Alberta, and 2,195 were in the Piegan, or Blackfoot, Agency, Montana.

BLACK FOREST, a chain of European mountains in the southwestern part of Germany, in Baden and Württemburg, running almost parallel with the Rhine for about eighty-five miles. The Danube, Neckar, Kinzig and other streams rise in the Black Forest, which is rather a chain of elevated plains than of isolated peaks. The highest summit is Feldberg, 4,900 feet. The principal mineral is iron, and there are numerous mineral springs. The forests are extensive, chiefly of pines and similar species, and yield much timber. The manufacture of wooden clocks, toys and musical instruments is the most important industry, employing about 40,000 persons. The inhabitants of the forest are quaint and simple in their habits, and the whole district preserves its old legendary associations.

BLACK FRIDAY. See GOULD, JAY.

BLACK GUM, an American tree yielding a tough, close-grained wood, used in making wheel hubs. The leaves are handsome and turn a bright crimson in autumn. The fruit is blue black in color, whence it seems to get its name of black, but there is no gum about the tree. It is called sour gum, pepperidge and tupelo, and has been introduced into Europe as an ornamental tree.

BLACK HAWK (1767–1838), a chief of the Sac and Fox tribes of Indians, who was born in Kaskaskia, Ill. He earned his position as head chief of the allied tribes by his successful expeditions against the Osage and Cherokee tribes. In 1804 the Sacs and Foxes agreed to cede to the United States lands extending about 800 miles along the Mississippi River. This contract Black Hawk repudiated, claiming that the chiefs had been made drunk before they signed the documents. During the War of 1812 Black Hawk, tempted by British agents, joined them with about 500 warriors, but soon retired from British service. In 1823 most of the Sacs and Foxes, under the leadership of Keokuk, removed to their reservation beyond the Mississippi River; but Black Hawk, with part of the tribe, refused to emigrate and fought with the whites what is known as the Black Hawk War. After several encounters, the Indians were defeated, and Black Hawk and his two sons became captives. The three were confined in Fortress Monroe until 1833, when they were permitted to join their tribe in the reservation near Fort Des Moines. A colossal statue in honor of Black Hawk, designed by Lorado Taft, has been placed on a bluff near Oregon, Ill.

BLACK HAWK

BLACK HILLS, a somewhat mountainous region located in the southwestern part of South Dakota and extending into Wyoming. The altitude varies from 2,500 or 3,000 feet to peaks 7,200 feet high. The Black Hills are known as one of the best mining regions in the United States. The territory was purchased of the Indians in 1876, and mining operations were begun the year following. Gold, silver, copper, lead, iron and a number of valuable building stones are obtained in the region. Gold to the value of over a hundred million dollars has been taken here.

BLACK HOLE OF CALCUTTA, a small room in an old fort in Calcutta, India, memorable as the scene of the death by suffocation of more than 100 English soldiers. On the night of June 20, 1756, 146 defenders of the fort were thrust into the room by their Hindu captors, and forced to remain there during the intensely hot night. The room, which was eighteen feet long and less than

fifteen feet wide, had only two small windows, and by morning all of the prisoners but twenty-three had died. A vivid description of the place is given in Macaulay's essay on Clive.

BLACK'ING, a dressing for boots and shoes, usually containing for its principal ingredients oil, vinegar, ivory or bone black, sugar or molasses, strong sulphuric acid and sometimes rubber gum and gum-arabic. It is used either as liquid or in the form of paste, the only difference being that in making the paste a portion of the vinegar is withheld and more lamp black or ivory black is added.

BLACKLIST, a printed and secretly distributed list of names of persons considered objectionable from the point of view of the compilers. As used in connection with labor problems the term refers to lists of persons considered undesirable as workmen by either employers or labor unions. Employers often object to prospective employes because of their activity in the cause of unionism, while the unions object to men for exactly opposite reasons, viz., that such persons have refused to join the union or obey its orders, or have lent their assistance as strike breakers. Laws against the use of blacklists have been passed by Congress and by about twenty-five states, but these laws are hard to enforce, because it is easy to conceal the exchange of information on which blacklists are based, and also because the employers may discharge workmen without giving any reason except that their services are no longer needed. Less is heard to-day than formerly about the existence of blacklists.

BLACK'MAIL, a certain amount of money, corn, cattle or the like, anciently paid, in the north of England and in Scotland, to certain men who were allied to robbers, for protection by them from pillage. The modern use of the term applies to money extorted from persons under threat of exposure for alleged violation of legal or moral codes.

BLACKMORE, Richard Doddridge (1825–1900), an English novelist whose fame rests almost entirely on *Lorna Doone*, a story of Exmoor and the neighboring district. This work, with its stirring plot and beautiful descriptions, is written with a realism which makes it hard for a reader to believe that it is but fiction. The author was born at Longworth, Berkshire, and educated at Tiverton school and Exeter College, Oxford. In 1852 he was called to the bar at the Middle Temple, and he practiced law until his health failed. While living on a fruit farm a short distance from London, he began his literary career by the publication of a volume of poems. Blackmore wrote a number of novels, besides his masterpiece, among which are *The Maid of Sker, Alice Lorraine, Cripps the Carrier, Mary Anerley* and *Kit and Kitty.*

BLACK MOUNTAINS, a ridge of mountains located in North Carolina and the northern part of Georgia and Alabama, and extending approximately east and west. The Black Mountains form the southern spurs of the Appalachian system and contain the highest peaks east of the Rocky Mountains. The most noted of these are Mount Mitchell, 6,710 feet, the highest point east of the Rocky Mountains on the American continent; and Clingman's Peak and Guyot's Peak, both of which exceed 6,500 feet in altitude. See Appalachians; Blue Ridge.

BLACK PRINCE The. See Edward, The Black Prince.

BLACK SEA, called by the ancients *Pontus Euxinus*, is a great body of water between Europe and Asia, covering 165,000 square miles in area, exclusive of its tributary, the Sea of Azov. It is considerably larger than the states of Ohio, Indiana and Michigan. The sea is connected with the Mediterranean by the Bosporus, the Sea of Marmora and the Dardanelles. It is 750 miles long, 380 miles wide, and its greatest depth is nearly a mile and a half. Navigation is attended with difficulty at times, owing to the violence of tempests which sweep over its surface.

On the European side are the important cities of Odessa and Batum. The leading city on its Asia Minor shores is Trebizond. In 1918, after the collapse of Russia in the World War, Germany commanded the Black Sea through its domination of the Ukraine and with the assistance of its ally, Turkey, on the south. After the defeat of Germany and its allies in November of that year the allied countries dominated this sea and assured its future freedom to the commerce of all nations.

BLACKSNAKE, in some sections known as the Blue Racer, or Green Racer, from its under surface, is a common snake in North America, reaching a length of five or six feet, and exceedingly agile and swift. It has no poisonous fangs and therefore is com-

paratively harmless, though it possesses the power of destroying very small prey by the contraction of its folds. Its power of contraction, however, is not sufficient to injure even a child. There was once a belief that it was an arch enemy of rattlesnakes and that it pursued and destroyed them. This is untrue.

The blacksnake is one of the most numerous of America's snakes; it lives on the ground, but is able to climb trees and to cross streams. It eats frogs, toads, birds and their eggs, mice, and the like. During the winter a number of these snakes will coil themselves into a ball for their long hibernation. The female lays from fifteen to twenty eggs in any secure place, and they hatch by the heat of the sun. If one desires such repulsive pets, the blacksnake, taken young, can in most instances be tamed.

BLACKSTONE, Sir William (1723–1780), probably the most notable lawyer of modern times, famous for his *Commentaries,* which every law student, even to-day, must read. He was admitted to the bar in 1746, but soon gave up the law and established a course of lectures at Oxford on the law and constitution of England. His lectures attracted much attention, and he was soon after appointed to the chair for the study of the common law of the country. After resigning his professorship, he published his lectures as *Commentaries on the Laws of England.* The merits of this book made it for a long time the principal text-book of English law, and all subsequent American and British commentaries have been based on it.

BLACK'WELL, Elizabeth (1821–1910), the first woman who ever obtained a medical diploma in the United States. She was born in England and in 1831 settled with her parents in America, where she was engaged in teaching for several years. After numerous difficulties she was admitted to the College of Geneva, N. Y., and was graduated in medicine in 1849. She afterward studied in Paris, and on her return to America commenced practice in New York, where she afterwards chiefly resided. In 1854, with her sister Emily, she opened a hospital for women and children in New York.

BLACKWELL'S ISLAND, a narrow island in the East River, a part of New York City. It is between Manhattan Island and Long Island and measures about one and one-half miles long and one-eighth of a mile wide. On this island are the penal institutions and hospitals of New York City.

BLAD'DER. See Kidneys.

BLAD'DERWORT, the common name of curious, slender, aquatic plants, species of which are natives of Great Britain and the United States. They grow in ditches and pools, and they are named from having little bladders or vesicles that fill with air at the time of flowering and raise the plant in the water, so that the blossoms expand above the surface. The bladders have small openings in which insects are sometimes caught, and if the ditch or pool dries up, the vesicles hold moisture and keep the plant alive for some time.

BLAINE, James Gillespie (1830–1893), one of the great statesmen of America, whose last years were filled with bitter regret that he had been denied the Presidency, the goal of his ambition. He was born near Pittsburgh, Pa., and was educated at Washington College, from which he graduated when only seventeen years of age. He taught school and studied law for several years, was married in 1851 and three years later went to Augusta, Maine, where he began editorial work on the Kennebec *Journal,* a weekly newspaper. He soon was offered a more influential position on the Portland *Daily Advertiser.* He joined the Republican party at its formation, early became its leader and practical dictator in Maine, was elected to the state legislature, where he served until 1862, and in 1863 took his seat in the House of Representatives.

JAMES G. BLAINE

He was made Speaker of the House in 1869, which position he held until 1875. While in Congress he made a number of important speeches on financial questions and participated in many celebrated debates, becoming known as a national leader of his party. He was later sent to the Senate, where he remained five years.

In 1875 he was accused of corrupt practices in securing legislation in favor of certain railroad projects in which he was interested. The charge was agitated by his political opponents and, together with certain parts of his record in Congress, made so many

enemies that he lost the popularity that might have led to the Presidency. He was unsuccessful in his candidature in 1876 and again in 1880, but became Secretary of State under Garfield. After the death of Garfield, Blaine resigned and began his *Twenty Years in Congress,* a voluminous and valuable work. In 1884 he was nominated for president, but was defeated by Cleveland. When Harrison was elected President, Blaine was made Secretary of State for the second time and fulfilled the duties of the office with distinction, dealing with several trying foreign questions with the utmost tact and ability. He was for years the leading exponent of the doctrine of reciprocity in commercial relations. He resigned from Harrison's Cabinet and became a candidate for the nomination for President in 1892, but was defeated in the convention.

BLAIR, the family name of three men, father and two sons, distinguished in American history.

Francis Preston Blair (1791–1876), was born in Virginia. He edited the Washington (D. C.) *Globe,* an organ of the Jackson Democrats, from 1829 to 1845, became one of the organizers of the Republican party in 1856 and was presiding officer of the convention which nominated John C. Fremont for President. Four years later he was a leading member in the Chicago convention which nominated Lincoln. He became a Democrat again in 1865, because opposed to the government's reconstruction policy.

Montgomery Blair (1813–1883), son of the above, was born in Kentucky, was graduated at West Point and served in the Seminole War. In Maryland, to which state he moved, he practiced law, and was counsel for Dred Scott in that celebrated case. With his father he joined the Republican party, and became Postmaster-General in Lincoln's first Cabinet. He was instrumental in introducing money orders, free mail delivery and the sorting of mail on trains.

Francis Preston Blair, Jr. (1821–1875), was born in Kentucky, served in the Mexican War, then edited a Missouri paper until 1856. As a Republican he served three terms in Congress. Volunteering in the Civil War, he rose to the rank of major-general in 1862. After the war, like his father, he became a Democrat again, and was the nominee for Vice-President on the ticket with Horatio Seymour. From 1870 to 1873 he filled a vacancy in the United States Senate.

BLAKE, Edward (1833–1912) a Canadian statesman, born in Adelaide, Ont., and educated at Upper Canada College and the University of Toronto. He was called to the bar in 1856 and soon became prominent. In 1867 he was elected to the Ontario assembly, where he was leader of the Liberal Opposition till 1871, when he became premier of the province. He resigned after a year, but again came into prominence in Hon. Alexander Mackenzie's ministry. In 1875 he became minister of justice, in the same month declining the chief justiceship of the Dominion. From 1867 till his retirement from political life in 1891 Blake served almost continuously in the House of Commons. From 1892 until 1907 he was a Nationalist member of the British House of Commons; he resigned because of ill health and returned to Toronto, where he died.

EDWARD BLAKE

BLAKE, Robert (1599–1657), a famous British admiral. He did not enter public life until, at the age of forty-one, he was sent to Parliament, where he won a name for himself in a short time. When the civil war broke out between the king and Parliament he raised a company of soldiers and won a number of land battles for the Parliamentary side. In 1649 he was made a general of the sea, and he soon proved that this was his true sphere. He destoyed the squadron of Prince Rupert and wrested from the royalists Guernsey, Jersey and the Scilly Isles. As a reward for these services Blake was made sole admiral, and he proved his fitness for the position by defeating the Dutch Admiral Tromp. Cromwell appointed him in 1654 to the command of the English fleet in the Mediterranean, and here he was victorious in contests with the Dutch, the Spanish and the French. He attacked Tunis, the dey of which had insulted the British flag, and routed an army of 3,000 Turks. At Algiers and at Tripoli he set free all the English slaves, and in 1657 he defeated the Spaniards at Santa Cruz.

BLANC, Mont. See Mont Blanc.

BLANC-MANGE, *blah mahNzh'* in cookery, the name of different preparations of the

consistency of a jelly, variously composed of dissolved isinglass, arrowroot, maize-flour and other substances, with milk and flavoring. Chocolate and fruit juices are frequently added, and the dish is a popular dessert.

BLAND, RICHARD PARKS (1835–1899), an American statesman, the leading advocate of bimetallism (which see) of his generation was born near Hartford, Ky. He practiced law in Missouri, California and Nevada, where he was also interested in mining. He was a member of Congress from Missouri from 1874 to 1895 and from 1897 to his death, gaining special prominence as an advocate of the free coinage of silver and as author of the Bland-Allison silver bill of 1878. He was a candidate for the Democratic nomination for President in 1896, but was defeated by William J. Bryan.

BLANK VERSE, verse without rhyme, first introduced into English poetry by the Earl of Surrey, in the first half of the sixteenth century. The most common form of English blank verse, that which is used in the dramas of Shakespeare, is the line of five iambic feet. There is often an extra syllable in a line, and sometimes the accent is on the first syllable of the foot. From Shakespeare's time blank verse has been almost universally employed by poet dramatists, although Dryden wrote his dramas in rhyme. The first use of the term blank verse is said to be in *Hamlet,* II, 2: "The lady shall say her mind freely, or the blank verse shall halt for't." The term is not applied to the Anglo-Saxon and early English alliterative unrhymed verse.

Bryant's *Thanatopsis* and Longfellow's *Evangeline* are written in blank verse. The first stanza of the latter is given as an excellent example:

This is the forest primeval. The murmuring
pines and the hemlocks,
Bearded with moss, and in garments green,
indistinct in the twilight,
Stand like Druids of eld, with voices sad and
prophetic,
Stand like harpers hoar, with beards that
rest on their bosoms.
Loud from its rocky caverns, the deep-voiced
neighboring ocean
Speaks, and in accents disconsolate answers
the wail of the forest.

BLARNEY STONE, a famous stone near the top of Blarney Castle, Ireland, which is four miles from the city of Cork. According to an old story, the first owner of the castle delayed its surrender by flattering speeches, and from this legend has come the custom of kissing the Blarney Stone, a practice that is said to give one the power of saying flattering things, or "blarneying."

BLASH'FIELD, EDWIN HOWLAND (1848–), an American artist, one of the foremost decorative painters of his time. He was born in New York City. Blashfield began his career as a figure painter, after several years of European travel and study, but since 1892 has devoted his time to the decoration of important buildings. He painted the central dome of the Library of Congress; made two great paintings for the Baltimore courthouse—*Washington Resigning his Commission* and *Lord Baltimore's Edict of Toleration;* and painted on the ceiling of the ballroom of the Waldorf-Astoria Hotel a picture representing *Dance and Music.* These are representative of his best work, which is greatly admired for beauty and delicacy of coloring. Blashfield and his wife are co-authors of *Italian Cities* and co-editors of Vasari's *Lives of the Painters.*

BLAST FURNACE, the name given to the common smelting-furnace, used for obtaining iron from its ores with the aid of a powerful blast of air. The process of smelting is described in the article STEEL.

BLAST'ING, the operation of breaking up masses of rock or other hard substances, by means of explosives, usually dynamite. In ordinary operations holes from 1 to 6 inches in diameter are bored into the rock by means of a steel-pointed drill. After the hole is bored to the requisite depth, it is cleaned out, the explosive is introduced, the hole is *tamped* or filled up with broken stone, clay or sand, and the charge is exploded by means of a fuse or by electricity. In larger operations, mines or shafts of considerable diameter take the place of the holes above described, and the excavations are made by machinery. Shafts are sunk from the top of the rock to various depths, sometimes upward of 60 feet. This shaft joins a heading, or gallery, driven in from the face, if possible, along a natural joint; and from this point other galleries are driven some distance in various directions, with headings at intervals, returning toward the face of the rock and terminating in chambers for the charges. Enormous charges are frequently made use of, upward of twenty tons of gunpowder having been fired in a single blast.

The greatest blasting operation ever attempted was the removal of the reefs in the

East River, near New York, known as Hell Gate. An entrance shaft was sunk on the Long Island shore, from which the reef projected. From this shaft nearly twenty tunnels were bored in all directions, extending from 200 to 240 feet, and connected by lateral galleries. Upward of 142 tons of dynamite, rackarock and powder were used, and millions of tons of rock were dislodged.

The most notable blasting operation of the present century was at Culebra Cut (now Gaillard Cut) on the Panama Canal, in October, 1913. The Gamboa dyke was blown up, to join the waters of the two oceans. Forty tons of dynamite were placed in 1,000 holes, and President Wilson, at the end of a special wire in Washington, ignited the charge. See DYNAMITE; GUNPOWDER.

BLAVATSKY, *bla vahts'ke,* HELENA PETROVNA HAHN-HAHN (1831–1891), a Russian theosophist, born in Ekaterinoslav. She traveled extensively and gained considerable reputation through her dealings with occult science and spiritism. She became thoroughly familiar with the Buddhist philosophy and other doctrines of the East and established in Bombay the *Theosophist.* Later investigations proved her pretended miracles impostures, but though she lost prestige, she had about 100,000 followers in Europe and America when she died. She was a voluminous writer. The most important of her works is *Isis Unveiled,* which is the text-book of her followers.

BLEACHING, the art of freeing textile fibers and fabrics from their natural color and rendering them white. The ancients bleached fabrics by exposing them to the action of the sun and frequently wetting them. This method was employed by the Egyptians, Babylonians and other peoples of antiquity. Modern bleaching seems to have originated with the Dutch, and for a long time they held a monopoly of the business for Europe. Their method was similar to that employed by the ancients and usually required an entire season for bleaching linen. The cloth was repeatedly steeped in lye, soaked in buttermilk, washed and spread upon the grass to whiten. Because of the great skill attained by these people, the name *hollands* was applied to the best grades of linen and is still retained; because of the method of bleaching the finest fabrics, by spreading them on the best plots of grass land, such fabrics were called *lawns.*

The Dutch method of bleaching has now been displaced by what is known as the *chlorine* process. This consists of cleaning the cloth, then boiling it for about twelve hours in a solution of water and slaked lime, to which a small quantity of caustic soda is added. After the boiling the cloth is washed, then passed through a pure solution of hydrochloric acid, washed again and then soaked for from two to four hours in a bleaching solution. This is prepared by dissolving bleaching powder (chloride of lime) in water, and adding a quantity of this to the bath. When taken from the bleaching solution, the cloth is again washed, then placed in a weak solution of sulphuric acid, which completes the process. After bleaching, the cloth is passed through a wash containing bluing; it is then starched, dried, calendered and packed for the market. In large bleaching houses the work is all done by machinery. Details of the process vary.

BLEEDING. See HEMORRHAGE.

BLEEDING HEART, a showy garden plant, so called because of its drooping, deep red flowers, which are irregularly heart-shaped. The branching stem grows to be from one to two feet high, and the three-lobed leaves somewhat resemble those of the peony. The bleeding heart is a spring-blooming perennial, native to Japan and China, and first introduced into Europe in 1846. It responds easily to cultivation, and the drooping sprays of rose-colored flowers make a striking decoration for garden borders.

BLENDE, *blend,* an ore of zinc, a mineral composed of zinc and sulphur and constituting the ore from which most of the zinc of commerce is obtained. When pure, it contains about sixty-six per cent of that metal. It occurs in both massive and crystallized forms, and in color it is yellow, brown or black. In the United States, deposits of blende occur in Illinois, Iowa, Missouri and Wisconsin. The most valuable European deposits are in Cornwall, England, in Saxony and in the Hartz Mountains. See ZINC.

BLENHEIM, *blen'im,* a village in Bavaria on the Danube, twenty-three miles north of Augsburg. Near it was fought in 1704, during the War of the Spanish Succession, the famous Battle of Blenheim, in which the allied forces of England and Germany, under the duke of Marlborough and Prince Eugene, gained a victory over the French and Bavarians.

BLENNERHAS'SETT, *blen er has'et*, HARMAN (1764–1831), a wealthy English-American, chiefly noted for his connection with the plot of Aaron Burr to found an independent empire in the Southwest. He was born at Hampshire, England, educated at London and at Trinity College, Dublin, but came to the United States in 1797 and settled on an island in the Ohio River below Parkersburg. Here, in 1805, he entertained Aaron Burr, who induced him to join in his conspiracy. When the scheme fell through, Blennerhassett was tried for treason, and though he was finally discharged, he lost his property. See BURR, AARON.

BLES'BOK, an antelope of South Africa, with a white marked face, a general purplish-chocolate body and a saddle of a bluish color. It was formerly found in great numbers in the Transvaal and Orange Free State, but hunters have reduced the number of blesboks materially.

BLIGHT, *blite*, a generic name commonly applied to denote the effects of disease upon plants, or any other circumstance which causes them to wither or decay. It has been vaguely applied to almost every disease of plants from any cause whatever. The term is frequently limited, however, to disease in cereal crops, and botanists confine it to diseases originating from bacteria or parasitic fungi. See RUSTS; SMUTS.

BLINDFISH, the descriptive name given to small, sightless fishes inhabiting the water in great caves. The Mammoth Cave of Kentucky contains characteristic specimens. The eyes are reduced to a rudimentary condition, which indicates that the remote ancestors of these fishes could see. Their bodies are translucent and colorless. The head and body are covered with small "feelers" which serve as organs of touch.

BLINDNESS, the lack of, or the deficiency in, the sense of sight. Blindness may vary in degree from the slightest impairment of vision to total loss of sight; it may also be temporary or permanent. It is caused by defect, disease or injury of the eye, of the optic nerve or of that part of the brain connected with it. Old age is sometimes accompanied by blindness, occasioned by the drying up of the humors of the eye, or by the opacity of the cornea or the crystalline lens. There are several causes which produce blindness from birth. Sometimes the eyelids adhere to each other, or to the eyeball itself; often a membrane covers the eyes; sometimes the pupil of the eye is closed, or adheres to the cornea, or is not situated in the right place, so that the rays of light do not fall in the middle of the eye.

Of the eye diseases common in infancy, the most serious is *ophthalmia neonatorum*, infection of the membrane that covers the lids and eyeballs. It usually appears on the second or third day after birth, and if not promptly checked causes permanent blindness. Typical symptoms are swollen lids and the discharge of matter. If the eyes of a new-born baby show the slightest signs of inflammation, they should be treated at once. A few drops of silver nitrate solution will prevent the infection from developing. One-third of the blindness in children is caused by this terrible disease.

Education of the Blind. The first book calling attention to the duty of educating the blind was published in Italy in 1616. While various attempts had been made to relieve the sufferings of these unfortunate persons, it was not until the latter part of the eighteenth century that any attempt was made to give them systematic instruction. The first school for this purpose was founded by Valentin Hauy in Paris in 1784. A similar school was established in England in 1791, and the success of these institutions was such that within the next twenty years schools for the blind were established in all of the leading countries of Europe. The first school in the United States was established in Massachusetts in 1829, as the New England Asylum for the Blind. From the start this school received aid from the state, and the other New England states availed themselves of the advantages it offered by sending, at state expense, their blind to this institution. The name New England Asylum was later changed to Perkins Institute and Massachusetts Asylum for the Blind, and the school, under the direction of Dr. Samuel G. Howe, became the leading institution of its kind in the country. Soon after its founding, the Perkins Institute gave exhibitions by its pupils before the legislatures of a number of different states, and the influence of this work was such as to secure the establishment of like institutions in many parts of America. The work has spread until now nearly every state maintains institutions for the education of the blind in its school system.

The education given is along three lines:

literary, including the branches taught in most high and secondary schools, with the exception that less attention is given to foreign languages; *musical,* including instruction on the piano, organ and other instruments, musical composition and the training of the pupils for giving lessons upon the different instruments; *industrial,* training in those occupations in which the blind can successfully engage, such as broom-making, basket-making, mattress-making, and sewing, knitting, crocheting, carpet-weaving and piano-tuning. In these lines many of the students become experts. For a long time the pianos in the public schools of Boston have been kept in tune by members of the Perkins Institute.

Since the blind obtain the greater part of their knowledge through the sense of touch, special books and apparatus are necessary for giving them a literary education. The first attempts at teaching the blind to read were by the use of raised letters, which in form were similar to the ordinary letters of the alphabet. They learned the forms of the letters by running the fingers over them, and in this way learned to read. Another system, known as the *point* system, is now in very general use. By this, different numbers of dots indicate the different letters of the alphabet. The advantage of this system over the other is that it enables the blind to write as well as read. The point is written by means of an apparatus consisting of a board with a grooved surface, over which a frame is fitted. The paper is placed on a board, the frame is laid upon it, and the points are made by the use of a stiletto, which is used with an abbreviated metal rule. The writing is from right to left, since the paper is reversed for reading. The point system in widest use is the *Braille.* It takes as its basis six points or dots. These are arranged in two vertical parallel columns, and are shifted into different combinations to indicate different letters.

In all of the best schools both the point and the alphabet system are in use. The advantage of the alphabet system is that it enables blind children to learn to read either at home or in the public schools, before they are old enough to enter an institute. Geography is taught by the use of relief maps, in which the towns are indicated by metallic points, the boundaries by raised lines, and the mountains, valleys and rivers in the ordinary manner of relief maps. Natural history is taught by the use of life-size models and mounted specimens of animals and birds, while botany is taught in a similar manner, only the models are larger than the plants which they represent, in order that the parts may be ascertained by touch.

Special printing establishments are maintained at Louisville, Ky., and in connection with the Perkins Institute in Boston. Through these, a library of about 100,000 volumes of the choicest works has been printed, and in the Congressional Library at Washington a special reading room has been provided, in which copies of these books are found. Copies are also distributed through the different institutes, so that reading matter is provided not only for those in the schools but for others.

In Canada the blind receive instruction in five residential schools, two of which enjoy government support. As in the United States, new ideas and advanced methods are welcomed, and wherever practicable they are adopted.

BLIND'WORM, a small brown or silvery-gray reptile common in Southern California. It is similar to but of less size than the glass-snake (which see). The blindworm is so called because of its small eyes and their covering of transparent skin.

BLISS, Philip Paul (1838–1876), an American evangelist, born at Clearfield, Pa. In company with the evangelist Dwight L. Moody, he held mission services in all parts of the United States, leading in the singing of hymns of his own composition. *Hold the Fort, Pull for the Shore,* and *Hallelujah, 'Tis Done* are the best known of these. He and his wife were killed in a railroad wreck at Ashtabula, Ohio.

BLISS, Tasker Howard (1853–), an American soldier, born at Lewisburg, Pa., and a graduate of West Point in 1875. After a period of teaching at the Naval War College and two years of service as attaché of the American legation at Madrid, he entered upon duty in the Spanish-American War. After peace was declared he was collector of customs at Havana, then was a special envoy to Cuba to negotiate a reciprocity treaty between that country and the United States. In 1903 he was commandant of the War College; from 1905 to 1909 he served in the Philippines; in 1911 was transferred to service on the Mexican border, and

in 1912 became commander of the Department of the East.

Early in 1915 Bliss became assistant chief of staff of the army, and in November of the same year he was raised to the grade of major-general. He was appointed acting chief of staff after the departure of General Hugh L. Scott to Russia, as a member of the Root mission, and in September, 1917, on Scott's retirement, he was made chief of staff. He reached the age of retirement on December 31, 1917, but was reappointed immediately, and raised to the full rank of general. General Bliss served on the inter-allied war council in France, and was one of the official American delegates to the Peace Conference which began sessions in January, 1919.

BLIS'TER, an application which, when employed on the skin, raises the cuticle in the form of a sac, which fills with serous fluid. The Spanish fly blister operates most certainly and most quickly and is commonly used; but mustard, croton oil, ammonia and other substances are also used. Blisters are employed in the treatment of pleurisy, muscular pains and joint disorders.

BLIZ'ZARD, the name given to a severe storm accompanied by a strong, cold wind and fine, dry snow or spicules of ice. The term applies particularly to storms of this character which are common during the winter in the northern part of the Mississippi basin, especially in the Dakotas and Minnesota, though they may extend as far south as the Ohio River. The blizzard is usually preceded by a short period of warm weather and comes without apparant forewarning, often causing loss of life among people who are far from home. During the storm the condition of the atmosphere is such as to make it exhausting both to men and animals, while the air is so completely filled with fine snow that it is impossible to see objects at a distance of more than a few feet. The Weather Bureau is now usually able to forecast the approach of these storms, so as to warn the inhabitants in time to enable them to find shelter before the storm breaks.

BLOCKADE', the closing of the ports of an enemy in time of war by naval or military forces of its opponent. Notice of contemplated blockade must be sent in advance to all neutral nations; if any vessel in defiance of a blockade attempts to trade with blockaded cities it does so at the risk of confiscation of ship and cargo. The crews of vessels caught cannot be punished.

In order that a blockade shall be recognized as such the blockading nation must have naval and military forces at hand in sufficient numbers to enforce its decree. If a blockade is decreed and there is insufficient force to patrol the shut-off coasts, such a decree is called a *paper blockade*—on paper only. Even in such case, however, any vessel caught in the attempt to pass through a loose blockade is subject to the same penalties, if caught, as would follow in case the patrol were more effective.

According to accepted rules of war blockades are legal, for it is the right of each belligerent (which see) to use all means in its power to weaken and distress the enemy. Not only is it proper to prevent arms and munitions of war from reaching an enemy, but it is just as important to keep out raw materials which enter into the manufacture of anything employed in war. This extends even to foodstuffs, notwithstanding the fact that an effective blockade may reduce non-combatants to the verge of starvation.

In the World War Germany thought its navy could prevent a blockade of its coasts by Great Britain and France. When it failed to do so it declared their blockade illegal, but very soon announced on its part a blockade of England's coasts, outlawing any vessel which approached nearer than a hundred miles on the Atlantic side. This was called a paper blockade by neutrals, because, even with the aid of its submarine fleet, it could not enforce its decree.

For an account of Napoleon's effort to conquer England by a blockade, see Continental System.

BLOCK AND TACKLE, a mechanical contrivance consisting of one or more grooved pulleys, mounted in a casing or shell, which is furnished with a hook, eye or strap by which it may be attached to an object, the function of the apparatus being to transmit power or change the direction of motion by means of a rope or chain passing round the movable pulleys. Blocks are single, double, treble or fourfold, according as the number of sheaves or pulleys is one, two, three or four. A *movable block* is attached to the ob-

BLOCK AND TACKLE.

ject to be raised or moved; a *fixed block* is attached to some permanent support. Blocks also receive different names from their shape, purpose and mode of application. They are made of either iron or wood. By the use of blocks heavy weights can be raised with comparatively little power.

BLOCK'HOUSE. In early times, and in localities where danger from enemies was always present, houses were built of heavy logs or blocks of hewn timber and were fitted with loopholes for musketry. When of more than one story, the upper stories were made to overhang those below, and in the overhanging floors loopholes were cut so that the defenders might fire down upon an enemy who undertook to break into the house or burn it. Such blockhouses were in general use among the American colonists in their wars with the Indians, and saved many lives, but they have not been generally used in warfare since the Boer War.

BLOCKHOUSE

BLOEMFONTEIN, *bloom'fon tine,* the capital of the province of the Orange Free State, in South Africa. It is ninety-five miles nearly east of Kimberley, and is at an altitude of 4,518 feet above the sea. The city is a railway junction on the Cape-to-Cairo Railway. It has numerous fine buildings, a college and a theological school. It was a Boer stronghold at the outset of the South-African War, but soon surrendered to Lord Roberts. The real growth of the town began after that war. Population, 1911, 14,720.

BLONDEL, *bloN del',* a French minstrel and poet of the twelfth century, the confidential servant and instructor in music of Richard, the Lion-hearted. While his master was the prisoner of the Duke of Austria, Blondel, according to the story, went through all parts of Germany in search of him. He sang the king's own favorite lays before each keep and fortress, till the song was at length taken up and answered from the windows of the castle of Durrenstein, where Richard was imprisoned. Sir Walter Scott alludes to Blondel in *The Talisman.*

BLOOD, *blud,* the fluid which circulates through the arteries and veins of the human body and is essential to the preservation of life and the nutrition of the tissues. The fluid content of the blood, a substance called plasma, is about ninety per cent water. Floating in the plasma are millions of tiny corpuscles, of which there are two kinds, red and white. As the former are by far the more numerous they determine the color of the blood. The proportion of white to red corpuscles is about one to 833. The latter are round, with edges thicker than their centers, and are $\frac{1}{3200}$ of an inch across. Red corpuscles contain haemoglobin, a substance which has the property of absorbing oxygen from the air. When charged with oxygen haemoglobin is bright red; when deprived of oxygen it turns darker.

White corpuscles are ball-shaped and larger than the red corpuscles. They have the power to destroy harmful bacteria, and so help protect the body from disease. Still another substance is found in the blood. It is a ferment called fibrinogen, and its function is to manufacture threads in blood exposed to the air on the surface of a wound. It is this process which causes blood to clot and so check the flow from a wound. In the body of an average adult male there are about six quarts of blood, or from twelve to fifteen pounds, about one-thirteenth his weight. For the manner in which the blood circulates through the body see CIRCULATION, with accompanying colored illustration.

Blood Pressure. In normal health the blood flows through the blood vessels with little friction, for they have sufficient elasticity to stretch with every beat of the heart. As one grows older, however, the walls of the tubes thicken and became less elastic, and as a result the blood in the vessels is under excessive pressure. High blood pressure is therefore an indication that one is aging or that the circulatory process is not normal. The general cause is wear and tear, which may result in younger people from overeating, indulgence in alcoholic liquors, overworking, worry, constipation, etc. The normal blood pressure of a person of twenty-three is from 105 to 110. A person of forty cannot safely have a pressure above 140. A prominent life insurance company states that the average pressures of a group of persons accepted were as follows: pressure of those under forty, 125; from forty to

forty-four, 128; forty-five to forty-nine, 130; fifty to fifty-four, 132; fifty-five to sixty, 134.

Related Articles. Consult the following titles for additional information:

Arteries	Haemoglobin	Hemorrhage
Capillaries	Heart	Veins

BLOOD, Avenger of, the name applied to one who executes vengeance on the slayer of a kinsman. In primitive society, when a man was killed or seriously injured, the punishment of the person committing the crime devolved, by the so-called right of blood feud, upon the next of kin of the injured person. As society advanced, there was gradually developed the right of sanctuary, and places of refuge were provided where a manslayer might be safe for a time from the avenger of blood. Still later, it was provided that the criminal might gain exemption by paying a fine, which the avenger was compelled to accept. The feuds of the Kentucky mountaineers are a survival of the old custom.

BLOODHOUND, a variety of dog with long, smooth, hanging ears and wrinkled face, remarkable above all other dogs for the acuteness of its smell. It takes its name from its habit of following the trail of wounded prey by the scent of the blood. Among the several varieties of this animal are the English, the Cuban and the African bloodhound, most of which are tawny in color, with black noses. In former times bloodhounds were not only trained to the pursuit of game, but also to the chase of man. They are now principally employed for tracking criminals and escaped convicts.

BLOOD-MONEY, the compensation paid by a manslayer to the next of kin of the person slain, securing the offender and his relatives against vengeance. It was once commón in Scandinavian and Teutonic countries, and is still heard of among the Arabs. Certain crimes, such as killing a sleeping person, were regarded as too heinous to be atoned for by a money payment, and the criminal was turned over to the vengeance of the relatives of the man slain.

BLOOD'ROOT, a plant of Canada and the United States, belonging to the poppy order, so named because its rootstock yields a sap of a deep orange color. The leaves are heart-shaped and deeply lobed, and come from the ground singly, folded around the flower stalk, which bears one white or rose-tinted blossom. The plant has been employed as an astringent.

BLOOD'Y ASSI'ZES, the term of court held by the English Judge Jeffreys in 1685, after the suppression of Monmouth's rebellion. About 300 persons were executed after short trials; very many were whipped, imprisoned and fined, and nearly 1,000 were sent as slaves to the American plantations.

BLOOM'ER COSTUME, a style of dress for women, consisting of a jacket with coat sleeves, a pair of full, loose trousers gathered into bands at the ankles, and a skirt reaching a little below the knees. This style orignated in 1849 in America and was adopted by Mrs. Bloomer of New York, whence the name. A modification of this costume gained temporary popularity among woman bicyclists and golf players, and it is a permanent garment in the gymnasium.

BLOOMFIELD - ZEISLER, *bloom'feeld zise'lur*, Fanny (1866–), an American pianist, born in Austrian Silesia. Her parents removed to Chicago, Ill., in 1868 and there provided liberally for their daughter's musical education. When she was eleven years old, her playing attracted the attention of eminent foreign musicians, and in the following year she began to study with Leschetizky. Before she was twenty years old she had played with success in most of the European musical centers, and after her return to America she won recognition as one of the foremost pianists of the time.

BLOOMINGTON, Ill., founded in 1824, is the county seat of McLean County, on the Illinois Central, Chicago & Alton, Big Four and Lake Erie & Western railroads, 126 miles southwest of Chicago and thirty-eight miles southeast of Peoria. The city has unusual educational facilities, for in addition to the public schools (the high-school building cost $400,000) there is the Illinois State Normal University, Illinois Wesleyan University (Methodist), a conservatory of music, a college of oratory and a business college. The manufacturing interests are varied. The city has repair shops of the Chicago & Alton Railroad. The commission form of government was adopted in 1915. Population, 1910, 25,768; in 1917, 27,462 (Federal estimate).

BLOOMINGTON, Ind., the county seat of Monroe County, sixty miles southwest of Indianapolis, on the Chicago, Indianapolis & Louisville and the Indianapolis Southern (Illinois Central) railroads. The city is the seat of the Indiana State University, whose

buildings represent an expenditure of $1,100,000; it has a Federal building, erected in 1912 at a cost of $70,000. There are vast limestone quarries, furniture, leather and hardware factories. The first settlement was made about 1818. Population in 1910, 8,838; in 1917, 11,661 (Federal estimate).

BLOW'FLY, a large blue and black fly, that lays its eggs upon meat or dead animals.

BLOWFLY

These eggs are called *fly blows*, and hatch very quickly into maggots, which destroy the meat. In the home the blowfly is a pest and a carrier of disease germs. It should be warred upon as vigorously as is the ordinary house fly.

BLOW'ING MACHINE, a device for supplying a continuous current of air under pressure. Blowing machines are used in connection with smelting furnaces for iron, in blowing glass and for ventilating mines and large buildings. The blowing machine now generally used is the fan or fan blast machine. In its most common form the fan consists of four spokes of a rimless wheel, tipped with vanes and made to rotate in a cylindrical chest, in which it has often a slightly eccentric position. There are openings on both sides round the spindle for admission of air, which, sucked in by the centrifugal action of the fan as it quickly rotates, flows toward the vanes, and is driven through an exit pipe attached to another part of the cylinder.

A new form of blower has a chamber in which three drums of equal size are enclosed, two in a line below and one above; the upper one is provided with wings, and the two lower have wide slots along their entire length, allowing the wings to enter in the course of rotation. The function of the two lower drums is to supply alternately abutments to prevent the escape of the air. They are caused to revolve in proper relation with the motion of the upper drum by spur-wheels on the journals, which mesh into another spur-wheel on the shaft of the upper drum.

BLOW'PIPE, an apparatus for driving a current of air through the flame of a lamp, candle or gas jet, and directing it upon any substance desired. In its simplest form the blowpipe is merely a conical tube of brass or glass, usually seven inches long and one-half inch in diameter at the larger end and tapering so as to have a very small aperture at the smaller end. Within about two inches of the smaller end the pipe is bent nearly to a right angle, so that the stream of air may be directed sidewise to the operator. The flame, if turned to a horizontal direction, takes a conical shape and consists of two different parts, each recognized by its peculiar color. The greatest heat is obtained at the tip of the inner or blue flame, if the substance subjected to it is burned or oxidized.

For instance, a small piece of lead or copper placed at this point is soon changed to lead or copper oxide, and hence the name of this flame is the *oxidizing* flame. By moving the substance to the interior blue flame, which contains no oxygen, the oxide will be removed and the pure metal will be left. For this reason this has been called the *reducing* flame. Many minerals can be either oxidized or reduced at pleasure, and the blowpipe forms a ready test in the hands of the mineralogist. The current of air is often produced by bellows instead of the breath, this instrument being fixed in a frame for the purpose.

BLUB'BER, the fat of whales and other large sea animals, from which train oil is obtained. The blubber lies under the skin and over the muscles. It is eaten by the Eskimo and the seacoast races of the Japanese islands. Refined blubber is the source of oils used in soapmaking and as lubricants and fuel. The whole quantity yielded by one whale ordinarily amounts to from two to four tons.

BLUCHER, *blük'ur*, GEBHARD LEBRECHT VON, Prince of Wahlstadt (1742–1819), a Prussian general, distinguished for the part he played in the Battle of Waterloo. When seventy years old he was appointed commander in chief of the Prussians in the struggle against Napoleon, and his heroism was shown in the battles of Lützen and Bautzen. He led the Prussian army which invaded

France early in 1814, entered Paris, and on the renewal of the war in 1815, when the chief command was again committed to him, he led his army into the Netherlands. Napoleon at once attacked him, and Blücher, on June 16, was defeated at Ligny. In the Battle of Waterloo Blücher arrived at the decisive moment and assisted materially in completing the great victory of the allies. See WATERLOO, BATTLE OF.

BLUE, one of the seven primary colors, seen in nature in the clear sky and the sea. The various shades of blue are most brilliantly displayed in the sapphire and the turquoise. In the arts blue is used as a dye and is derived from products of the vegetable, animal and mineral kingdoms. Indigo is the most common vegetable material for producting it. The principal blues used in painting are ultramarine, Prussian or Berlin, Bremen and cobalt. In the three-color process of printing, blue is used with yellow and red.

BLUE'BEARD, the chief character in a legend that has been told since the seventeenth century. Bluebeard, so called because his beard was of a bluish shade, was a monster of cruelty. When about to depart on a journey he gave to his wife Fatima the keys of his castle, warning her that the door of a certain room should not be unlocked. Unable to conquer her curiosity, Fatima opened the door and found in the forbidden room the bodies of six women, her predecessors, whom Bluebeard had killed in succession. When the bloodthirsty husband returned home he discovered Fatima's disobedience by blood on the key, and would have made her a seventh victim had her brothers not arrived in time to save her by killing him. Though Bluebeard is a fictitious character, it is believed that the legend is founded on the wicked acts of a certain Gilles de Laval, who lived in the fifteenth century.

BLUEBELL, a name applied to several plants that bear nodding, bell-shaped flowers. The Virginia cowslip, bell-flower and harebell are all called bluebell in the localities where they grow. The harebell is the bluebell of Scotland, famed in song and story.

BLUE'BIRD, one of the favorite wild birds of the United States, lovable because of its bright color and pretty ways and its sweet song. The bluebird appears among the earliest of the birds that go north in the spring, and, if undisturbed, it stops in the Northern states and builds its nest fearlessly in a hollow stump, fence post or other retreat very near houses and people. The same pair will nest year after year in a place that they find to their liking. They are fine songsters, and their cheerful notes may be heard throughout the entire season, though most frequently in early spring. The bluebird is a small thrush, with bright blue back, reddish throat and breast and white under parts. It is frequently disturbed by the English sparrow, and has been practically driven from some localities.

In Bryant's *Yellow Violet* the early coming of the bluebird is suggested in these lines:

When beechen buds begin to swell,
And woods the bluebird's warble know,
The yellow violet's modest bell
Peeps from the last year's leaves below.

BLUE BOOKS, the official reports, papers and documents printed for the British government and laid before the Houses of Parliament, so called from their being stitched up in dark-blue paper wrappers. They include bills presented to, and acts passed by, Parliament; all reports and papers called for by members, or granted by government on particular subjects, and the reports of committees. In the United States the name is applied officially to lists of persons in the government employ, and to the manual which contains regulations for the navy.

At intervals the belligerent nations in the World War published books stating their position in the conflict. These were named according to the color of the binding, as the Belgian *Gray Book*, the British *White Paper*, the French *Green Book*, etc.

BLUEFIELD, W. VA., founded in 1888 and incorporated in 1893, is in Mercer County, at the extreme southern end of the state, on the Norfolk & Western Railroad. The city is the home of a state normal, and has a fine Federal building and two sanitariums. There are railroad shops and important soft coal mining interests. It is governed on the commission plan. Population, 1910, 11,118; in 1917, 16,123 (Federal estimate).

BLUEFIELDS, NICARAGUA, a city situated on the Mosquito Coast near the mouth of the Bluefields River. It has a land-locked harbor, and is connected with Galveston and New Orleans by direct lines of steamers. The shipments are large, and consist mostly of bananas and other tropical fruit. It is

the seat of a United States consular agency and a Moravian mission. Population, about 5,000.

BLUE'FISH, a sea fish, common on the eastern coasts of America, allied to the mackerel, but larger, growing to the length of three feet or more, and much esteemed for the table. It is very destructive to other fishes. Bluefish are taken in nets and by hook, furnishing by the latter method great sport. New York City alone uses ever $250,000 worth of bluefish in a year.

BLUE GRASS, an American pasture grass of great excellence, especially abundant in Kentucky, which is known as the Blue Grass State. Blue grass thrives best on clay soils overlying limestone, and it is excellent for lawns.

BLUE JAY. See JAY.

BLUE LAWS, a name for certain laws formerly believed to have been made in the early government of New Haven, Conn., but now known to have been the product, in large part, of the brain of Rev. Samuel Peters, a minister who was driven from the colony to England, and who thereafter devoted himself to ridiculing the Americans. Among those which he declared had been passed were the following:

No food or lodging shall be offered to a Quaker, Adamite or other heretic.

No one to cross a river on Sunday but an authorized clergyman.

No one shall run on the sabbath day, or walk in his garden, except reverently to and from meeting.

No woman shall kiss her child on the sabbath or fasting day.

No one shall buy or sell lands without permission of the selectmen.

Whoever wears clothes trimmed with gold, silver, or bone lace above two shillings by the yard, shall be presented by the grand jurors, and the selectmen shall tax the offender at 300 pounds estate.

No one shall read common prayer, keep Christmas or saint-days, make minced pies, dance, play cards, or play on any instrument of music, except the drum, trumpet and Jew's-harp.

Every male shall have his hair cut round according to a cap.

Blue Laws of To-day. In modern times certain restrictions in regard to matters of personal conduct are often called blue laws. Regulations in respect to liquor drinking, to strict observance of the Sabbath and the like are considered blue laws by those who are opposed to such restrictions as an infringement on personal liberty.

BLUE MOUN'TAINS, the name applied to several ranges of mountains in different parts of the world: (1) The Blue Mountains of New South Wales, which run nearly parallel to the coast and form a part of the mountain system of Australia. This range extends from Wilson's Promontory on the south to Cape York on the north, and has an altitude of over 4,000 feet. (2) The Blue Mountains of Jamaica. These form the most important range of the island and traverse it nearly its entire length. Their greatest altitude is nearly 8,000 feet. (3) The Blue Mountains of New York, New Jersey and Pennsylvania, more properly known as the Kittatinny. These mountains are east of the Blue Ridge and should not be confounded with them. (4) The range of mountains in Oregon and Washington. They separate the Columbia River from the Great Basin and have an altitude of from 8,000 to 9,000 feet.

BLUE PRINT, a photographic picture obtained by the use of a cyanide. The process is in common use by architects and engineers for copying plans. The sensitive paper is prepared by being brushed over with a solution of oxalic acid and iron and then being treated with a solution of potassium ferrocyanide. When this paper is exposed to light under the drawing, which is made on vellum or other very translucent paper, a photograph is imprinted upon the sensitive paper. On washing in pure water, this is developed in the form of a blue print. The lines of the drawing protect the cyanide from the action of light, and in washing those portions are dissolved, leaving upon the picture white lines in place of the black lines in the drawing. Sunlight or electric light may be used for the process. Blue prints of photographic negatives can be made in the same manner.

BLUE RACER, a name often applied to the blacksnake (which see).

BLUE RIDGE, the most easterly ridge of the Alleghany or Appalachian Mountains. It extends from West Point, N. J., to the northern boundaries of Alabama and Georgia. In the southern portion it is crossed by several ranges, the most important being the Black Mountains, the Nantahala and the South Mountains. The name Blue Ridge refers properly to that portion of the range which crosses Virginia and separates the Piedmont region from the Great Valley. The most elevated summits are the Peaks of Otter (4,000 feet), in Virginia.

"BLUE SKY" LAWS, a term applied to laws which regulate the issue and sale of stocks and bonds by corporations. These laws are designed to protect credulous buyers from fraud. Many corporations advertise generous dividends, when in reality they have little security, and millions of dollars are lost every year by investors who are deceived by glowing promises. About half of the states of the Union have passed legislation to check the evil. Usually the law requires dealers in stocks and bonds to operate under a state license, and they must file with the proper authorities detailed information about their propositions.

Kansas, in 1911, was the first state to pass "blue sky" legislation. The term is supposed to have originated in the remark of a Kansas bank commissioner, who said that the blue sky was being used as security by some corporations; another said that a wily agent could capitalize and sell the blue sky. In 1919 there was considerable agitation for a national "blue sky" law, as thousands of people were being induced to invest their Liberty Bonds in dubious enterprises.

BLUE VIT'RIOL, a compound of copper and sulphuric acid having the chemical name of copper sulphate. It appears in the form of dark blue crystals, and is obtained as a by-product in refining gold and silver with sulphuric acid. The compound is employed in calico printing and in dyeing, in the making of electrotypes and in copperplating, in electric batteries, as a preservative of timber and in the making of other copper compounds. Blue vitriol is poisonous and is an effective ingredient in mixtures used to kill insects. On exposure to the air the blue crystals turn white and crumble.

BLUN'DERBUSS, an old-fashioned smooth-bore gun, the barrel of which terminated in a somewhat bell-shaped muzzle.

BLUNDERBUSS

Several bullets could be put in at one load. It made an effective weapon at short range, because the charge always scattered in all directions. No one hears the name anymore except in a figurative sense. A person who is clumsy in his movements or wastes his energies by lack of concentration is sometimes called a blunderbuss.

BLUSH'ING, or the reddening of the face and neck through modesty, confusion or shame, is a local modification of the circulation of the blood. Certain nerves are stimulated and as a result the arteries expand and more blood flows through them. The cheeks become red, or the flush may extend to the roots of the hair or "all over." Sensitive people blush readily. One who is too caloused to blush is said to be *unblushing*, or hardened.

Terror causes other nerves to be stimulated, and the tiny blood vessels contract instead of expand. As a result the blood flow is lessened and the skin becomes pale. Mark Twain said, "Man is the only animal that blushes—or needs to."

BO'A, a group of South American serpents of great size and enormous strength. They seize and crush in the folds of their strong bodies animals as large as sheep and deer, and, having broken the bones, they are able to swallow the animals entire, the neck stretching to many times its own diameter. After eating, the snake remains sometimes for several weeks without motion and seemingly more than half asleep. The *boa constrictor*, which rarely exceeds twelve feet in length, is not one of the largest of the boas, but the name boa constrictor is often given by the public to any large serpent of similar habit; consequently, the term in common speech includes the pythons of the Old World and the anaconda and other large serpents in America. The only members of the boa family in the United States are two or three small species found in and around Arizona. See PYTHON; ANACONDA.

BOABDIL, *bo ahb deel'*, or **ABU-ABDULLAH**, *ah boo'ab dil'ah*, the last of the Moorish dynasty in Granada, Spain. Boabdil seized the throne from his father in 1482, but was unable to hold the allegiance of his subjects, and early in 1492 his kingdom was overpowered by Ferdinand and Isabella, of Castile and Aragon, who have a small but conspicuous place in American history. The spot where the king is said to have taken his last view of his lost kingdom is exhibited to travelers as the "last sigh of the Moor." Tradition says that Boabdil was killed while fighting in Africa in behalf of the ruler of Fez.

BOAR, *bor,* the wild hog of Europe and North Africa. The boar-hunt on foot, with spears for weapons, was once the favorite amusement in England and Northern Europe. The boar was very strong, fierce and fleet, and was armed with curving tusks, which could inflict dangerous wounds. The chase was therefore very exciting. In India a popular sport is to hunt the native boar on horseback. Boars are much larger than

WILD BOAR

domesticated hogs and are covered with short hair and stiff bristles, which form a crest along the spine. They feed in the night time on vegetables of different kinds.

BOARD OF TRADE, an organization of men who deal in produce, particularly in wheat, oats, corn, etc., and partly through whose operations the prices of these commodities are fixed. The value of products is regulated by the law of supply and demand; boards of trade have definite knowledge of crop prospects, the quantities of grain on hand in all countries, and the approximate needs of all peoples from one harvest to another. The market price of a grain changes from day to day as crop prospects or demands for cereals fluctuate. If wheat on a certain date is quoted at $1.50 per bushel and the next day come reports of disaster to the growing crop over a wide area, the price advances; if reports show that all over the wheat-growing sections of the world there are prospects of a crop in excess of expectations and of needs, the cereal becomes less valuable per bushel in the estimation of boards of trade, and the price declines. These statements summarize the situation in normal times; in periods of great disorder, like the World War, abnormal conditions compel government control and price-fixing.

Trading on "Margins." The practice of buying and selling on "margins," which means cash security advanced to protect the agent against loss, has grown to be a leading feature on boards of trade. According to this method of dealing, the trader deposits with his broker a sufficient amount to cover the ordinary fluctuations of the commodity bought or sold, and the broker furnishes the rest of the necessary capital. For instance, in January the trader wishes to buy 5,000 bushels of wheat for delivery in February. If the present price is $1 a bushel, he advances his broker $250, which is a margin of five cents a bushel. If the price of wheat advances, he can order the broker to sell it, and if he chooses, withdraw his margin as well as a profit, according to the extent of the rise. If the price recedes below $.95 or below the point where his margin will cover the loss, he must either deposit enough margin with his broker to cover the falling off or lose what he has advanced.

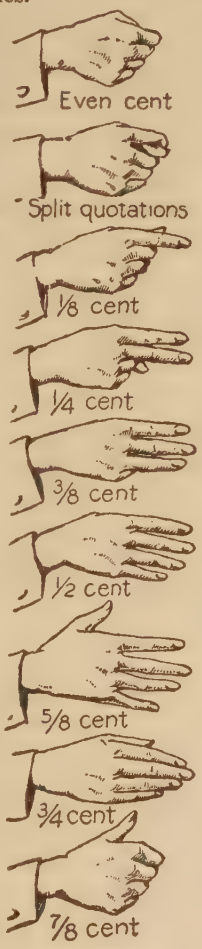
A "Corner" in Grains. In business a "corner" is an apparent scarcity of a commodity, created by a combination organized for the purpose of holding the article affected off the market, in order to extort abnormally high prices. The most memorable attempted wheat corners on the Chicago Board of Trade occurred in May, 1867, when the price of wheat was forced to $2.85; in September, 1888, when wheat sold as high as $2.00; and in May, 1898, when it went to $1.85, on account of the Leiter deal.

"Long" and "Short" Transactions. The distinction between so-called *long* and *short* transactions is as follows: In the former, the trader buys, expecting a later advance in price to net him a profit; in the latter, he sells, expecting a subsequent decline. This is known as dealing in "futures."

Board of Trade Rules. Most boards of trade have their own clearing houses, and at the end of each business day all parties who have been trading on the board must send reports of sales and purchases to the clearing house. Those whose reports show net loss must send certified checks for the amount, and those who have made net gains are paid. By common consent a basis of grading and inspection of grains and provisions has been established throughout the United States, in

which all the boards of trade unite. White winter wheat is divided into numbers 1, 2, 3 and 4; long red winter into numbers 1 and 2; hard winter wheat into numbers 1, 2, 3 and 4; red winter wheat into numbers 1, 2, 3 and 4. Spring wheat is classed as numbers 1 and 2, northern spring; numbers 1, 2, 3 and 4, spring. The same close discrimination is made with regard to corn, oats, rye, barley and all other articles.

The most stringent regulations are made to prevent fraudulent practice on the board. The smallest fraud on the part of any member, however prominent he may be, is punished by immediate suspension, and his trial is prosecuted with a rigid impartiality not surpassed by the courts of law. There is a widespread misunderstanding in regard to transactions on the board, many persons believing that no property is transferred in purchases and sales on margins, whereas the rules of the board not only contemplate the delivery of all property bought and sold on the floor, but express provision has been made therefor, and strict penalties are prescribed for all damages that may arise in case of nondelivery upon the maturity of a contract. A board of trade contract matures on the last day of the term mentioned in it, and all transactions between members for purchases or sales on the floor of the board are strictly contracts under its rules.



THE SIGNS
Each position of the fingers indicates a different fraction of a cent.

How Purchases and Sales Are Made. In the midst of all the noise and confusion which the outsider observes on the floor of the board during the hours when it is in session, there is a vast and thoroughly systematized volume of business being transacted with a facility and celerity utterly incomprehensible to the uninitiated. The brokers on the Chicago Board of Trade, for example, have a sign language peculiar to themselves, by which they can make themselves understood above the din constantly prevailing. A sign made with the open hand of the broker toward the person he is in communication with, signifies "sell"; if he shows the back of his hand, it means "buy"; one finger raised means 5,000 bushels or other units of the article dealt in; two fingers raised signifies 10,000 bushels, and so on.

The sign manual of the trader in the "pit," as the spot where business is transacted is called, is simplicity itself. For instance, wheat having sold at 90 cents, a trader catches the eye of someone opposite in the pit who has 10,000 bushels to sell, and signals that he will take the "10" wheat at 90. The seller, in reply, holds up his right hand with the index finger extended horizontally, indicating he wants ⅛ cent more than the price quoted, or 90⅛ cents. The buyer motions acceptance and signals back "⅛." The seller and buyer then note on their cards "Sold 10 at ⅛, Jones;" and "Bought 10 at ⅛, Smith," respectively, the number of bushels bought and sold always meaning so many thousands. After leaving the pit the two traders meet and check the operations.

Principal Boards of Trade. Liverpool is the world's center for distribution of grain; Chicago, in the midst of the grain areas of the United States, is the greatest distributor in America. Therefore the boards of trade in these two cities are powerful in affecting prices. The daily fluctuations on these boards are telegraphed all over the world, and the prices prevailing there stabilize values everywhere.

Each great city has its board of trade, but all others are dependent for leadership in a great degree upon the two named.

BOARDS OF HEALTH. See HEALTH, BOARDS OF.

BOAT, *bote,* a small open vessel or water craft moved by oars, by sails or by gas or electric power. Boats vary much in form, dimension and use. There are many special names applied to special kinds, as, for instance, the punt and dory, flat-bottomed boats; cutters, which are narrow and swift, usually with a square-cut stern, including such varieties as dingey, launch, gig and barge; whale boat and lifeboat, sharp at both

ends; racing shell, long, narrow and offering the least possible resistance to the water and fitted with sliding seats to give the oarsmen greater power. Since the invention of steam and gasoline engines and electric motors, the making of small motor boats has developed rapidly, and some of these are capable of as high a speed as forty miles an hour. Every passenger ship is required to carry a number of boats, proportional to its size and to the number of passengers. Among such boats are a longboat, a fully equipped lifeboat and numerous smaller boats, some of which are of canvas and collapsible so that they occupy but little room on the decks. A ship's boats are raised or lowered by hand with block and tackle, or by steam or electric power. When not in use the boats are hung on davits at the sides of the vessel.

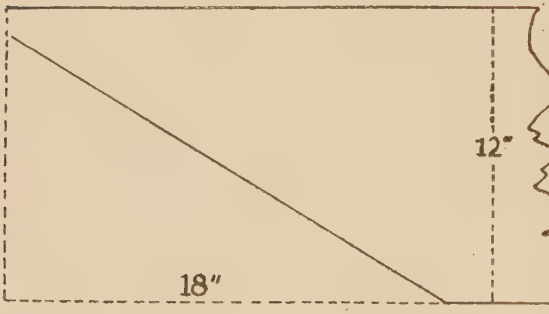


FIG 1

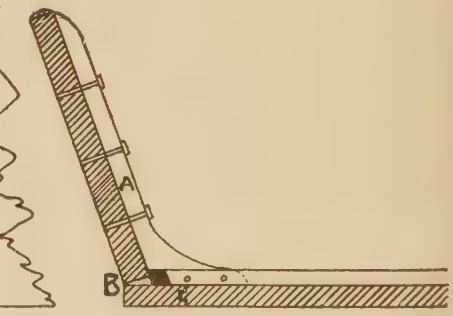


FIG. 2

How to Build a Punt. The simplest kind of boat to build is a punt, or flat-bottomed boat; any boy who knows how to handle ordinary tools can build one. It is not necessary that he have any tools but a hammer, bradawl, handsaw, and some nails; but the addition of a jack and smoothing plane, tenon saw, rule, square and bevel will result in quicker and better work. Almost any wood may be used; and for nails, common iron nails, if heated to a dull red in the fire, and then allowed to cool gradually, will do. Better nails should be used, if possible, but the amateur craftsman should also learn to make the best of the materials on hand.

Before designing a punt, the builder should know the purpose for which it is intended. Incidentally it may be laid down as a rule never to start work on a boat till you have drawn plans for it. Not even the most experienced professional builders venture to build a boat without plans. The amateur's plans need not be elaborate but they should show the dimensions and general outlines. The boy who knows something of drafting will have no difficulties, but any boy can draw some sort of plans. The size and weight of the boat will depend on the purpose: for fishing, hunting and ordinary use the essentials are comfort, durability and strength, rather than speed or lightness. As a rule the length may be from three to four times the beam—the longer the boat the larger the ratio. The beam is the width of the boat at the widest part, that is, in the middle. A good size for most purposes is eight long by three feet wide at the beam, tapering to a width of two and a half feet at the bow and stern.

Having fixed on the dimensions, you must select the material; for this red pine or spruce will be best and cheapest. For nails use copper boat nails or, if these are not available, galvanized iron nails. A few strong iron screws will also be needed. Before beginning to build the boat it will be best to set up two horses or trestles, so that you may work on the boat at a convenient height. These horses may be firmly fastened to the ground, if you are working out of doors, by burying the legs a few inches in the soil.

For the sides of the punt use two planks, 8 ft. long, 1 ft. wide, 1 in. thick. First draw a line from one edge. 18 in. from each end, to within one inch of the other edge and end of the plank. (Figure 1.) Saw off the triangular pieces at both ends of both planks. Now cut two pieces, 2 ft-10 in. long by 1 ft. wide and 1 in. thick. Use any odd strips of wood to fasten these two pieces together, exactly 1 ft.-6 in. apart; these pieces form the "box." Now take up the side planks and fix them with a light stay and tack to the trestle exactly 2 ft.-10 in. apart and upside down.

Great care must be taken that they are exactly true to each other, that both are on the same level and perpendicular, and the ends are exactly opposite. Now put the box across the punt and exactly in the center of the length of the planks; it may be temporarily supported to stays from below. Now screw a $2\frac{1}{2}$ in. screw through the side plank into each side of the box, about 2 in. from the top edge, and another about 3 in. from the bottom edge. The box will now be a permanent midship frame for the punt. Nail any two pieces of wood lightly to the edges of the planks so that the ends will be just 2 ft.-6 in apart. The punt will have an even

stringers nails must be driven from the outside and riveted or clouted before proceeding further.

Now cut out twelve knees (A in Figure 2) of one-inch hardwood planks; these should be placed 12 in. apart on each side. Light iron knees are preferable; but the wooden ones, if carefully selected so that the grain runs as far as possible with the curve and for some distance up the long arm of the knee, will be fully satisfactory. For bottom strips cut pine one inch square of the length required to fit snugly across the punt. Put in each set of side knees and bottom strips complete before putting in another set. The amateur

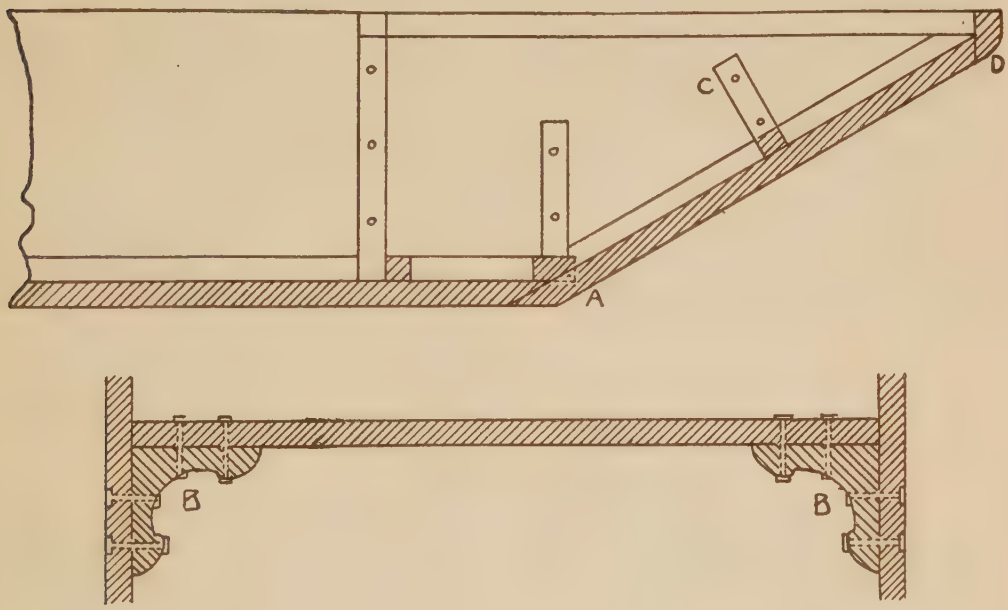


FIG. 3.

better shape if the bottom edges are only 2 ft. apart and the top edges 2 ft.-6 in.; the bottom edges may easily be drawn in to the desired width.

For the two side stringers cut strips of pine 5 ft. long and 1 in. square; each of these must be carefully nailed inside the punt to the bottom edge of the planks, so that they project about one-eighth of an inch. This is done so that when the bottom of the punt is put on there may be a little recess for calking (as at B, Figure 2). The two planks forming the well will interfere with the placing of the stringers, so they must each have a small recess cut into them to allow the stringers to pass through. In nailing on the

must exercise great care that these are all on the same level with the bottom of the stringers, otherwise they will make it difficult to put on the bottom. The bottom strips should all be put on the same sides of the side frames, so that the spaces between them may be even.

The ends remain to be finished. First, cut a pine strip an inch square just long enough to fit firmly between the ends of the stringers; this must be placed so as to project a little beyond the bevel of the side planks, (as shown by the dotted lines at A) and on a level with the stringers. To hold this in place nail a hardwood knee 1 in. high, each arm six inches long, on each end, (as shown

at B, Fig. 3). Now put in a stringer from A to D, and knees and bottom strip at C. Plane the ends as shown in the illustration. All the nails must now be carefully rooved and riveted or clouted as shown.

The bottom must now be put on. If possible use three planks matched and grooved, 5 ft. long, by 1 ft. wide and 1 in. thick. Bore holes for all the nails that go through the bottom planks with a fine bradawl. Now bring the first plank down on the frames at each end and secure it lightly with one nail. Do not drive the nails home till you are sure the planks fit properly. The ends of the planking will probably project at each end of the punt; these projections may be sawed off later. A coat of thick paint on the tongues and grooves just before the planks

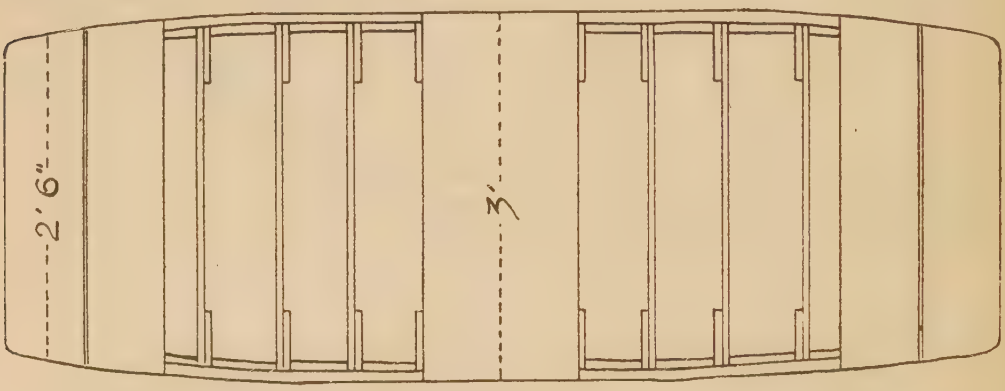


FIG. 4

are put on will help to keep the bottom water-tight; but be careful not to put in too much, else the planks will not close together. If the bottom fits properly drive home two more nails through each plank where it crosses the frame. You will probably need an assistant to back up these nails with a heavy hammer or anvil while you rivet or clout them. Now saw off the ends of the planks and the end frame as shown at A (Fig. 3) also at D. Put in the ends, in the same manner as the bottom, and clout the nails.

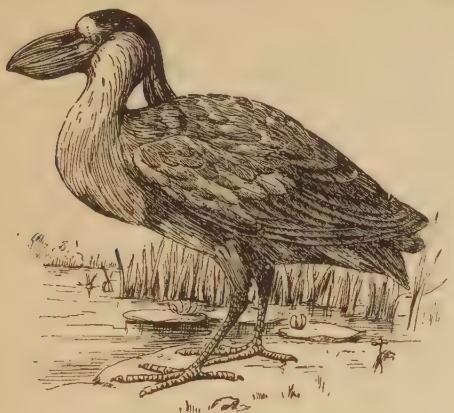
All that remains is the calking of the seams, painting and fitting. For calking you need a calking chisel made of hard wood, and any light springy mallet; if you have a calking iron, so much the better. In preparing pitch first melt it over a gentle fire, mix a little tallow with it, keep it well stirred, and be careful that it does not catch fire. To test the quality, dip a little stick into it and cool the pitch that adheres to it in cold water. If the drop that hangs from the stick is brittle it shows there is not sufficient tallow in it, so more must be added and mixed in; if the drop is soft and sticky more pitch must be added. Wind oakum into a loose cord that will fit nicely into the seam to be stopped when it is compressed under the mallet; dip the oakum piece by piece into the hot pitch till it becomes saturated, and then drive it into the openings with sharp, quick blows of the mallet and chisel. Some experience is needed to calk well, but several trials will enable even an amateur to do creditable work. Fill the cracks quite full, going over them two or three times if necessary. The chisel will constantly stick to the oakum and draw it out of the seams unless it is dipped into oil whenever the tendency to stick appears. After all the seams have been calked give the inside of the boat a thin coat of pitch; finally, after the pitch is thoroughly dry, the inside should have a coat of paint to fill up all the little cracks and joints. The builder may, if he desires, deck the ends and the box in the middle; this is such a simple matter that explicit directions are unnecessary. For painting, dark gray or green is the best color; two or three coats should be applied at intervals of five to seven days.

The punt is now completed. If you have built with only moderate skill you will yet have a serviceable craft that will last for many years. With a pole or an old oar you will be able to propel your boat in any direction you wish.

Related Articles. Consult the following titles for additional information:

Canoe and Canoeing
Motor Boat
Rowing
Sailboat and Sailing
Ship
Yacht and Yachting

BOAT'BILL, a South American heron which differs from its relatives in having a broad, heavy bill and rather short legs. The bill itself is not unlike a boat with the keel



BOATBILL

uppermost, and on the lower side is a pouch in which food can be carried. The boatbill lives in South America and takes its food from the streams, which it watches from an overhanging limb.

BOAT'SWAIN, a warrant-officer in the navy, who has charge of the sails, rigging, colors, anchors, cables and cordage. His office is also to summon the crew to their duties and this he does by a shrill whistle. In the United States navy the boatswain has from $1,200 to $2,250 a year while in active service, the pay increasing at the rate of $200 a year. After he has served ten years he becomes *chief boatswain* and ranks with the *ensigns.* In the merchant service, the boatswain is one of the crew who has charge of the rigging and oversees the men.

BOB'OLINK, in the United States one of the most pleasing of the song birds that nest in the North. The male is a handsome fellow, generally black, but wearing a buff cap, shoulder straps and band across the back. The female, who is dull and streaked with yellow, builds her nest on the ground in the tall grass. She tends the nest, but the male protects her and sings almost without stopping from the tops of brush or high weeds near by. His name is given because his clear notes resemble the word.

Bryant, in his *Robert of Lincoln,* describes the bird in charming verse:

Merrily swinging on brier and weed,
Near the nest of his little dame,
Over the mountain-side or mead,
Robert of Lincoln is telling his name:
Bob-o'-link, bob-o'-link,
Spink, spank, spink.
Snug and safe is that nest of ours,
Hidden among the summer flowers
Chee, chee, chee.

When the nesting season is over, the bobolink loses his brilliancy and, joining with others of his kind in large flocks, flies to the reeds and marshes of the seacoast and inland waters. Here he becomes very fat and his flesh is esteemed as the greatest of delicacies. He loses, too, the name of bobolink and is known to the hunters and to epicures as a *reed bird,* or *rice bunting,* when he feeds in the rice fields. Because of its being hunted so much in the South, the bobolink is protected by law from indiscriminate slaughter.

BOCCACCIO, *bok kah'cho,* GIOVANNI (1313–1375), an Italian novelist and poet, son of a Florentine merchant. The *Decameron,* on which his fame rests, consists of one hundred tales, supposed to have been related in ten days by a party of ladies and gentlemen who had withdrawn to a country house near Florence, while the plague was raging in that city. These stories, told swiftly and vividly, are full of wit and beauty, but they are marred by their licen-

BOBOLINK

tious tone. For this, however, the age, which permitted and even demanded such things, is to blame, rather than Boccaccio himself.

Boccaccio was remarkably precocious, and wrote verses before he was seven years of age. Nevertheless, by his father's wish, he spent some years unprofitably in the study of the canon law; he was able to devote

himself entirely to literature only after he had taken his degree in law. In 1331 he fell in love with Maria, daughter of King Robert of Naples, and his first work, a romantic love tale in prose, *Filocopo,* was written at her command.

BOCHUM, *bok'um,* GERMANY, a city in the Prussian province of Westphalia, nine miles east of Essen, which has more than

BOEHMERIA

quadrupled its population since the outbreak of the World War. In 1910 Bochum had a population of 136,916; in April, 1918, the number of inhabitants was given officially as 764,774, making it the third largest city in the empire. Bochum owed its astonishing growth to the war munitions industry, of which it was a center. Even in normal times thousands of people find employment in the iron, steel and coal industries there, and the war vastly stimulated these activities. The place is a well-built, modern city, and is governed by a municipal council of twenty-four members.

BODLEIAN, *bod'lean,* **LIBRARY**, a famous library at Oxford, founded by Sir Thomas Bodley in 1598 and opened in 1602. It claims a copy of all works published in Britain, and for rare works and manuscripts it is said to be second only to the Vatican. It contains over 1,500,000 volumes.

BOEHMERIA, *bom e'ri ah,* a genus of plants closely resembling the stinging nettle. One species is the Chinese grass, which is shrubby and three or four feet high. It is a native of China, Southeastern Asia and the Asiatic Archipelago, and it has long been cultivated there and in India. From its fibers is made a beautiful glossy fabric called China-grass cloth. Ramie is a species of boehmeria whose fiber is utilized in making cordage, banknote paper, nets and cloth. The cultivation of Chinese grass is carried on to a small extent in California.

BOEOTIA, *be o'shi a,* in ancient times a division of Central Greece, lying between Attica and Phocis. The surface is generally level and forms a basin in which lies Lake Copaïs, into which the Cephissus flows. South of the lake are the famous Helicon Mountains, the seat of the ancient worship of the Muses. The earliest settlers were Pelasgians and Phoenicians. They were conquered in 1124 B. C. by an alien people calling themselves Boeotians. These people organized the Boeotian League, a confederacy consisting of fourteen independent cities with Thebes at its head.

In the Persian Wars Boeotia sided with Persia, and during the Peloponnesian War it was the bitterest enemy of Athens, though from 456 to 487 B. C. it had belonged to the Athenian League. The Boeotian League was at the height of its power under Epaminondas and Pelopidas and fought desperately against Macedonia. The League was finally dissolved by the Romans in 171 B. C. The Boeotians were always regarded as stolid and unimaginative, and most of them cared but little for culture.

BOER, *boor,* a Dutch word which means peasant, and which is applied to settlers of Dutch descent in South Africa. See TRANSVAAL, THE; SOUTH AFRICAN WAR.

BOER WAR. See SOUTH AFRICAN WAR.

BOG, a piece of wet, soft and spongy ground, where the soil is composed mainly of decaying and decayed vegetable matter. Such ground is valueless for agriculture until reclaimed by drainage, but often yields an abundance of peat for fuel or muck for fertilizer. See MARSH.

BOG OAK, trunks and large branches of oak found imbedded in bogs, and so preserved that the grain of the wood is little

affected by the years of interment. It is of a shining black or ebony color and is frequently converted into ornamental pieces of furniture and smaller ornaments, as brooches, earrings, and the like.

BOGOTA, *bo go tah'*, COLOMBIA, capital of the republic and of the state of Cundinamarca, and one of the foremost centers of education in South America. The location is pleasant and healthful, and the water supply is obtained from mountain streams. Among the important public buildings are those of the university, the capitol, a public library, a museum and the National School of Fine Arts. Bogota is the largest center of internal trade of the country, and it has manufactures of soap, cloth and leather, though these are not of great importance. The city was founded in 1538 and soon became the capital of the province of New Granada. When the Republic of Colombia was established in 1819, Bogota became the capital of the new nation. Population, 1915, 122,369.

BOHEMIA, *bo he'mi a*, a country in the central part of Europe, from 1526 to 1918 a province of the former Austrian Empire. In the thirteenth century Bohemia was one of the strongest kingdoms of Europe, but after 1526, when a Hapsburg king ascended the throne, it came under Austrian rule. In the latter part of the eighteenth century a national feeling developed, and for over a hundred years the dominant element in the population, the Czechs, struggled to keep it alive. When, in 1914, Bohemia was swept into the struggle that became the World War, the Czechs seized the opportunity to further their own cause. Thousands of the soldiers deserted to the allies, and in 1918, when the Austro-Hungarian monarchy was tottering to its fall, Bohemia joined with Moravia, Silesia and Slovakia and formed the independent Czecho-Slovak Republic.

Location, Area, Population. Bohemia occupies a section in the northwestern corner of what was formerly Austria-Hungary. German Bavaria lies to the southwest of it, Moravia to the east and southeast, and parts of Germany to the west and north. The area is about 20,000 square miles, a little more than that of Vermont and New Hampshire combined. Next to Galicia, Bohemia was the largest Austrian province. In 1910 the population was 6,769,548; in 1913 it was estimated at 6,860,029, or about 343 persons to the square mile. Prague, the capital, was second in population among Austrian cities, ranking next to Vienna. As it is surpassed by Budapest, capital of Hungary, it was the third city in the Austro-Hungarian monarchy.

Resources. Austria valued Bohemia for its mineral wealth, as it was the richest province in coal, iron, silver and gold. Bohemia is also important as an agricultural section, though the soil has been drawn upon for hundreds of years. Wheat, oats, rye, barley, potatoes, hops and sugar beets are the staple products. Almost all the land is under cultivation; small farms are the rule, and intensive cultivation is practiced. Notable among the manufactured products are chinaware and beer; the city of Pilsen is famous for the latter, and Carlsbad for the former.

History. Bohemia was first settled by the Boii, who were driven out by the Germans during the first century B. C. In the ninth century Christianity was introduced by the Germans, and soon after this Bohemia became a part of the Moravian kingdom of Svatopluk. From the early part of the tenth century to the fourteenth the country was tributary to Germany, and during this time its interests were greatly advanced. From 1278 to 1305 Bohemia was one of the most powerful kingdoms of Europe and extended its sway from the Elbe to the Adriatic. Soon after this the control passed to the House of Luxemburg, where it remained for more than a century, and several of the kings of Bohemia were emperors of Germany. About 1400 the religious movement inaugurated by John Huss occurred, and this brought on wars which lasted for a number of years, during which the Czechs were enabled to stay the influence of the Germans. In 1526 the country came under the rule of the Hapsburgs, remaining dependent on Austria until 1918, as related above.

Related Articles. Consult the following titles for additional information:

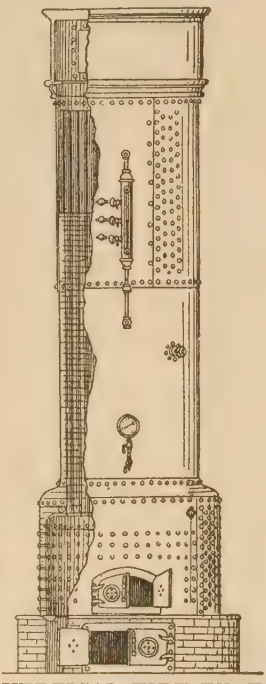
Austria	Pilsen
Czech	Prague
Czecho-Slovak Republic	Reformation, The
Huss, John	Thirty Years' War
Masaryk, Thomas G.	World War

BOIES, *boiz*, HORACE (1827–), an American lawyer and politician, born at Aurora, Erie Co., N. Y. He moved to Wisconsin territory in 1844, worked on a farm for six years, later studied law in New York state and was admitted to the bar, beginning practice at Buffalo in 1849. He was elected

to the legislature in 1858 as a Republican, but moved in 1861 to Waterloo, Iowa. There he left the Republican party, owing to opposition to a high tariff, and in 1890 was elected governor, being the only Democratic governor of the state since the Republican party was organized. He was a prominent candidate for the Democratic nomination for president in 1896 and was defeated for Congress in 1902.

BOIL, a small, painful swelling of a conical shape on the surface of the body. Its base is hard, while its apex is soft and of a whitish color. Boils are caused by poisonous bacteria, which find their way under the skin through a sweat gland or hair follicle. It is usually necessary to lance a boil to permit the discharge of pus. The discharges from a boil should be carefully kept from contact with the skin and should be burned with all the cloths used about the diseased part.

BOIL'ER, a strong vessel made of iron, steel or copper plates riveted together and used for producing steam under pressure. Boilers are used for supplying engines with steam, warming buildings and for certain manufacturing processes. Since they generate steam under high pressure, the first essential of boilers is that they be of great strength. They are of cylindrical form, usually with ends curving slightly outward. The greatest care is observed in their construction, and strict attention is given to the minutest details of design in order to provide strength.



VERTICAL FIRE-TUBE BOILER

The essential parts of a boiler are the *shell*, or envelope; the *flues*, or tubes through which the gases from the fire pass; the *furnace*, which holds the fire; the *grate*, on which the fire is built; the *ash pit*, which is under the grate and receives the ashes, and the *steam dome*, which is on top of the boiler and is used to collect the steam. Large boilers have numerous accessory parts which vary according to the size and pattern of the boiler. Certain accessory parts are necessary to all boilers. Among these are the *safety valve*, which is gauged to release steam when it has reached a given pressure; the *water gauges*, which indicate the height of water in the boiler; the *steam gauge* (see GAUGE, STEAM), which shows the pressure of steam, and the *pump* or *indicator*, which supplies the boiler with water.

There are many varieties of boilers, each of which is specially adapted to certain conditions. According to structure, boilers are classified into tubular, flue and water tube boilers, and according to their positions, as horizontal or upright. *Flue* boilers have one or more large flues passing through the interior. The heated gas passes through the flues, which are surrounded by water, thus bringing the heat into contact with all the water at nearly the same time. *Tubular* boilers differ from flue boilers only in having a large number of small tubes instead of one or two large ones. These utilize more heat than the flue boilers and are in general use on locomotives, for stationary engines and for heating large buildings. The *water tube* boiler is constructed so that the water is in tubes which are surrounded by the fire and burning gases. These boilers are considered safer than the old style tubular boiler; they generate steam very rapidly and secure a high pressure; consequently, they are in quite general use where high pressure is required.

Low-pressure boilers, in which steam can be sent through pipes when the pressure is as low as three pounds to the square inch, are used in buildings for heating purposes; in engines designed for heavy work high-pressure boilers are used, in which the pressure varies from 140 pounds upwards.

Boilers are built both vertical and horizontal; most small ones are of the former type, but the majority of large ones are of the latter. See STEAM ENGINE.

BOIL'ING POINT, the temperature at which a liquid boils. The boiling point for water at sea level is 212° F. or 100° C. Ether boils at about 96°, alcohol at about 173° and mercury at 662°. Under the same conditions the boiling point for the same liquid is al-

ways the same. The boiling point is raised by increasing the pressure on the surface. Practical application of this principle is seen in cooking meat and vegetables by boiling. A tight cover on the kettle increases the pressure upon the surface of the water and raises the boiling point so that the cooking is accomplished much more quickly. The boiling point is lowered with the decrease of pressure. Since the pressure of the atmosphere is greatest at sea level, the boiling point is lowered with the increase of altitude, and on the high mountains it is so low that vegetables and meat cannot be cooked by boiling in an open kettle. This principle is used in the construction of vacuum pans, which are enclosed vessels connected with air pumps that exhaust the air and vapor from over the surface of the boiling liquid and thus reduce the pressure, making it possible to boil the liquids at a low temperature.

This principle can be illustrated by a simple experiment. Take a round-bottom flask or a common soda water bottle, fill it about half full of water, then place it in a kettle of water and gradually bring this to the boiling point. When the water in the bottle has reached the same temperature, remove the bottle, cork it tightly and invert it. Place a damp cloth on it, and upon this pour cold water. The cold water condenses the steam, and the water in the bottle immediately begins to boil. By taking care the water can be made to boil three or four times. Placing salts or other substances in water usually raises the boiling point, while the injection of gases into a liquid usually lowers the boiling point.

BOIS DE BOULOGNE, *bwah de boo lo' ny'*, a pleasant grove near the gates on the west side of Paris, so named after the suburb Boulogne-sur-Seine. Its trees were more or less destroyed during the Franco-German War. It is still, however, one of the pleasantest Parisian holiday promenades and one of the most beautiful parks of the city. See PARIS.

BOISE, *boi'ze*, IDAHO, the capital of the state, its largest city, and the county-seat of Ada County, on the Boise River and the Oregon Short Line Railroad. It is in an agricultural and mining district and is one of the largest wool markets in the United States. Water is derived from the river for irrigation and for power in manufacturing. Natural hot water gushes forth from a flowing well and is extensively used for heating buildings. Important institutions are the largest enclosed natatorium in the United States, a Carnegie Library, several schools for higher education, business colleges, the United States assay office, a new state capitol, costing $2,000,000, a penitentiary and a soldiers' home. Near the city is Arrowrock Dam, the highest in the world (see IRRIGATION). Boise occupies the site of an old trading post of the Hudson's Bay Company and was settled in 1863. The commission form of government was adopted in 1912. Population, 1910, 17,358; in 1917, 35,951 (Federal estimate).

BOK, EDWARD W. (1863–), an American journalist to whose industry and talent is due much credit for the present influence of the *Ladies' Home Journal*. He assumed the editorship of that periodical in 1889, and made it one of the most popular journals not only in the United States but in the world. Many worthy movements have been sponsored in its pages by the editor, such as the campaign against harmful patent medicines and the movement for simplicity in house furnishings. Bok was born in the Netherlands, but emigrated to America when six years of age. After completing a public school education he began business life as an office boy. Later he worked as a stenographer in various publishing companies, and founded the Bok Syndicate Press. Two years after his promotion to the editorship of the *Journal* he was made vice-president of the great publishing company which owns that magazine, *The Saturday Evening Post* and *The Country Gentleman*. The head of the company, Cyrus H. K. Curtis, is Bok's father-in-law. Bok retired in 1920.

BOKHARA, *bo Kah'rah*, an absolute monarchy in Central Asia, which until the revolution of 1917 in Russia was practically a vassal state of that country (see PROTECTORATE). It is situated between Russian Turkestan and Afghanistan, has an area of 83,000 square miles—about that of Idaho—and a population of 1,250,000. The religion of the people is Mohammedanism. The reigning sovereign, or amir, is Sayid-Mir-Alim Khan (born 1880), who succeeded to the throne in 1911. The country is bordered on the north by the Hindu Kush Mountains, and on the east by the Bolor Tagh. Most of the region is a level plateau, covered with dry steppes and sandy wastes. The important

rivers of Bokhara are the Amu or Oxus, and the Samarcand. The climate is temperate, the rainfall light, and along the banks of the streams the land is fertile. The most important crops are cotton, rice, wheat, barley, fruits, silk and tobacco. The inhabitants are chiefly engaged in raising live stock, especially camels, goats and horses. The manufactures are few and limited. They include silk fabrics, gold and silver ornaments, firearms and sabers.

The country has considerable commerce with Russia. It is mostly by caravan, though there is one railroad, the Russian-Transcaspian, with 183 miles of track within the country. There is one telegraph line, from Tashkent, in Asiatic Russia (population 271,900) to Bokhara, the capital. The latter city has 75,000 people. The entire country was a part of ancient Bactria, and was conquered by Genghis Khan in 1219. About three centuries later it passed under the rule of the Uzbegs. In 1864 it became subject to the Russian authorities and has continued as a dependency of the Russian Empire.

BOLEYN, *bull'en*, ANNE (1501?–1536), the second of the six wives of Henry VIII of England. She went to France with Mary, sister of Henry, at Mary's marriage with Louis XII, and on her return to England about 1522, became lady of honor to Queen Catharine. The king, who soon grew fond of her, without waiting for the official completion of his divorce from Catharine, married Anne in January, 1533, having previously created her Marchioness of Pembroke. Then Cranmer declared the first marriage void and the second valid, and Anne was crowned at Westminster with unparalleled splendor. In September, 1533, she became the mother of Elizabeth. She was speedily, however, in turn supplanted by her own lady of honor, Jane Seymour. Suspicions of infidelity were alleged against her, and in 1536 the queen was brought before a jury of peers on a charge of treason and impropriety of conduct. Smeaton, a musician, who was arrested with others, confessed, and on May 17 she was condemned to death. The clemency of Henry went no further than the substitution of the scaffold for the stake, and she was beheaded on May 19, 1536. Whether she was guilty or not has never been decided; that she was exceedingly indiscreet is certain.

ANNE BOLEYN

BOLINGBROKE, *bol'ing brook*, HENRY SAINT JOHN, VISCOUNT (1678–1751), an English statesman who is known in history as a clever and versatile but unscrupulous schemer. In 1701 he obtained a seat in the House of Commons, attaching himself to the Tories, but in 1712 he was called to the House of Lords with the title of Viscount Bolingbroke, and in the following year he concluded the Peace of Utrecht. Queen Anne made Bolingbroke Prime Minister, but she died a few days later, and Bolingbroke, dismissed by King George, fled to France to escape the inevitable impeachment which he knew would be the result of the Peace of Utrecht. James Stuart the Pretender, invited him to Lorraine and made him his secretary of state, but dismissed him in 1716, on a suspicion of treachery. In 1723 he was permitted to return to England. Bolingbroke withdrew entirely from politics, spent several years at Battersea and finally returned to France. Pope was indebted to him for suggestions for his *Essay on Man*.

BOLIVAR, SIMON (1783–1830), a leader in the South American struggle for independence, called the "South-American Washington." He studied law in Madrid, returned to South America in 1809 and in the following year took part in a revolutionary rising in Caracas. In the struggles of New Granada, Venezuela, Bolivia and Peru for freedom from Spanish rule, he was the most prominent man, and when in 1819 New Granada and Venezuela were consolidated into a republic under the name of Colombia, Bolivar was made president. In 1823 he became dictator of Peru, but he held the office only two years. The constitution of Bolivia, which he framed, excited in the minds of his enemies the fear that he wished to make himself perpetual dictator over Colombia, Peru and Bolivia, and he lost some of his influence. The presidency of Colombia he held until a few months before his death. Perhaps no other South American has been honored with a greater number of monuments.

Bolivian Indians

BOLIVIA, *bo liv'i a*, the larger of the only two countries in South America which have no seacoast, the other being its southeastern neighbor, Paraguay. Because of its comparative isolation it has not advanced commercially as rapidly as its resources have made possible, but from another viewpoint its location will prove fortunate in the future. It touches the boundaries of the three greatest South American countries—Brazil, Argentina and Chile—and their present rapid development is reaching across the borders and giving fresh impetus to the shut-in country.

Bolivia is 950 miles long, practically the distance from New York City to Chicago; its greatest width is 800 miles. The area of the country is 514,155 square miles, but there were only 1,744,568 people in 1900, fewer than four to the square mile. There has not been a more recent census; previous to 1900 there had not been a census since 1854. The estimated population in 1915 was 2,889,970.

The People and Their Languages. The inhabitants include whites and Indians, the latter constituting over half of the population. The whites are mostly Spaniards and their descendants. The Indians are divided between two nationalities, the Quichuas and the Aymaras. The latter are descendants from the Incas, who occupied the territory previous to the Spanish conquest, and live in the high plains to the east of the mountains, where they are engaged in agriculture and in raising live stock. The Quichuas are employed in working the mines and as domestic servants, and some engage in tilling the land. The whites hold all public offices of importance and fill the leading professional and commercial positions. Most of the small tradesmen are known as Mestizos, and are persons of mixed Indian and white blood. Spanish is the prevailing language, but the Indians maintain their native tongue. Nearly all the people are Roman Catholics.

The only large town is La Paz (100,099), and it is described elsewhere. Sucre, the capital, has 29,686 people. Other towns are Cochabamba (31,014) and Potosi (29,795).

Education. Theoretically the government provides a system of public schools and makes education compulsory, but the laws are not enforced. The schools are entirely inadequate to the demands and are of very poor quality, and a large proportion of the inhabitants is illiterate. About 900 elementary schools are maintained. A few high schools and industrial schools exist, and there are twenty-one universities and colleges in the country. Schools for the Indian children are also maintained by missions of the various churches. Eighty-one per cent of the people in 1915 were estimated as unable to write.

Transportation. There is one main railroad in Bolivia. It enters the country from Cuzco, Peru, passes through La Paz and Oruro, and extends southwest to Antofagasta, Chile, on the Atlantic. Branches reach to Cochabamba and into Northern Argentina. Country roads are few and poor, and those in the mountains are for pack animals only.

The rivers communicating with the Atlantic furnish an outlet for those sections of country through which they flow, but the distance to the seaport is so great that the expense of transportation precludes extensive traffic.

Surface and Drainage. The western part of the country is traversed by two parallel ranges of the Andes, which extend from the northwest to the southeast. Of these the eastern range is much the higher, and it contains several peaks exceeding 20,000 feet in altitude. Among the peaks of the western range is the volcano Sajama, which reaches an altitude of 21,000 feet. Between these ranges lies the Bolivian plateau, having an altitude of from 12,000 to 13,000 feet and traversed by a number of small ranges. In this plateau is located Lake Titicaca, which has an elevation of 12,000 feet (see TITICACA, LAKE OF). East of the mountains the country consists of a plain which descends by a gradual slope from the foothills to an elevation of about 300 feet at the eastern boundary.

The principal rivers traverse this plain, flowing into the Madeira, which waters the northern, and the Paraguay, which waters the southern, part of the country. The largest of these streams are the Bermejo and the Pilcomayo in the south, and the Bene Itenez and Marmore in the north. All of these are navigable.

Natural Resources. Since its discovery Bolivia has been noted for its mineral wealth. A part of the gold which the Spaniards found in the possession of the Incas was taken from mines of Bolivia, but after the conquest these mines were not worked until the Spaniards enslaved the natives and compelled them to labor. At no time since the conquest has the output of gold been proportional to the richness of the mines. Silver now constitutes the most important mineral product, and Bolivia ranks fifth among the silver-producing countries of the world. Other important metals are in tin, copper, lead and zinc.

Rubber has become an important article of commerce; within recent years the acreage of rubber trees has been rapidly extended. The rubber exports now amount to over $8,000,000. Peruvian bark is also a valuable product. The great obstacle to realization of wealth from the country's resources is its lack of good transportation.

Climate. The country has three climatic regions, the warm or semi-tropical region, occupying the lowlands of the east, the temperate region, found in the intermediate altitudes, and the cold region of the mountains and the Bolivian plateau. The rainy season lasts through December, January and February, and during this time rains and hailstorms are of frequent occurrence. The most desirable climatic region is that of the middle latitudes, where the climate is temperate and salubrious. There is in most sections sufficient rainfall for agriculture.

Agriculture. The great plain east of the mountains contains some fertile land; nevertheless, agriculture is almost entirely neglected, and the methods employed in cultivating the soil are of the most primitive sort. The land is owned by the Indians or by wealthy whites who reside in towns. All work is by the natives and is done by hand labor, and because of the inefficient methods the returns are poor. The chief crops are alfalfa, barley, sugar cane, coffee, cacao, potatoes and cereals. Extensive areas are given to grazing, and large herds of llamas, vicuñas, alpacas and sheep, and in some localities horses and cattle, are found. The forests cover large areas.

There are practically no manufactures.

Government. The government is republican in form. The executive power is vested in the President, elected by the people for four years. He is assisted by two Vice-Presidents, elected in the same way and for the same term, and by five Ministers. The legislative department consists of a national assembly of two houses, the Senate and the Chamber of Deputies. The Senate is composed of eighteen members, elected for six years, and the Chamber of seventy-five members, elected for four years. For the purpose of local government the country is divided into eight departments, and each of these is subdivided into provinces and cantons. The courts consist of one Supreme Court and a number of superior and inferior courts. The judges of these are nominated by the Chamber of Deputies and confirmed by the Senate.

History. Bolivia was a part of the ancient empire of the Incas. It was conquered by the Spaniards under Pizarro in 1538. During the following century and a half, the Spaniards subdued and enslaved the natives. In 1780 an Indian uprising occurred, which caused considerable trouble. The country remained under Spanish rule until 1825, when it gained its independence, organized a republican form of government and adopted a constitution proposed by General Bolivar, for whom the country is named. Since that time Bolivia has been harassed by rebellions and revolutions to such an extent as to paralyze its industries and prevent either social or civic development. As a result of the war in which Bolivia and Peru combined against Chile in 1884 Bolivia was compelled to relinquish the portion of its territory bordering upon the sea, and since that time it has been a land-locked nation.

There has been but one revolution in forty years; in 1898 civil strife for six months resulted in the overthrow of one President and the substitution of another. In 1904 Bolivia undertook by negotiation to reclaim the coast territory ceded to Chile, but without success. In the World War, Bolivia did not actually join the cause of the entente allies, but in 1917 it severed relations with Germany and declared its sympathy with them.

BOLL WEEVIL, *bole wee'v'l,* an insect which is very injurious to the cotton plant. Introduced into Texas from Mexico in 1892, it gradually spread northward, and by 1917 had reached the cotton fields of North Carolina. The creature is a small beetle of a grayish color. The female lays its eggs in the cotton bolls (whence the name) and in

punctures of the buds, called squares. When the larvae hatch they stay within the squares or bolls, feeding upon their contents. The cotton fiber of infested bolls is rendered valueless, while a square usually falls to the ground. It is estimated that the cotton crop of the United States is annually diminished about 400,000 bales by this pest, though the government is working energetically to exterminate it. The Department of Agriculture has recommended the following:

The field ought to be cleaned in the fall by uprooting the stalks of the old plant, collecting with them the fallen bolls and burning them. This is a very important step, for it destroys all the insects and larvae that have accumulated there. Then the field ought to be plowed deep in the fall and prepared during the winter for an early crop. This can be done by planting early maturing varieties, and by fertilizing when necessary.

BOLOGNA, *bo lo'nyah*, ITALY, an important industrial and educational center, capital of the province of Bologna. It lies in a fertile plain at the base of the Apennines, eighty-three miles north of Florence. Bologna contains many beautiful churches, and has long been renowned for its university, founded as early as 1088, and having a library of over 255,000 volumes and 5,000 manuscripts. The Academy of Fine Arts has a rich collection of paintings by native artists, such as Francia, and those of the later Bolognese school, of which the Carracci, Guido Reni, Domenichino and Albano were the founders. The city has important manufactures of sausages, macaroni, silk goods, velvet, chemicals and paper.

Bologna was founded by the Etruscans under the name of Felsina. It became in 189 B. C. the Roman colony Bononia, passed into the hands of the Franks later and was made a free city by Charlemagne in A. D. 800. In the twelfth and thirteenth centuries it was one of the most flourishing of the Italian republics, but the feuds between the different parties of the nobles led to its submission to the Papal see in 1514. Several attempts were made to throw off the Papal yoke, one of which, in 1831, was for a time successful. In 1849 the Austrians obtained possession of it. In 1860 it was annexed to the dominions of King Victor Emmanuel. Population, 1911, 172,628; in 1915, estimated, 189,770.

BOLOGNESE, *bo lo nyeez'*, SCHOOL OF PAINTING. See PAINTING.

BOLSHEVIKI, *bol shev i ke'*, a party of Russian radicals who gained control of the revolutionary government in November, 1917, and supplanted the government headed by Alexander Kerensky. The name means *majority*, and was originally applied as a nickname to the extreme wing of the Socialists at the Congress of Russian Socialists held in 1903.

The Bolsheviki organized a Cabinet on November 9, with Nikolai Lenine as Premier and Leon Trotzky as Foreign Minister, and soon began negotiations with the Central Powers for the conclusion of peace. Peace was formally recognized by the Treaty of Brest-Litovsk (1918), as a result of which Russia was dismembered, and the provinces along the German frontier became "buffer" states under German influence. "Residue-Russia," as German official statements termed the part left to the Bolsheviki, fell into a chaotic state.

The program of the Bolsheviki included a revolution of the working people of all countries, and the setting up of government by them. They frankly admit that they are against all classes except the common people, and the disorders in Russia under their rule were due to their adherence to this principle. The middle classes, the property owners and the nobility were excluded from any participation in the government and were unable to assert their rights because the great peasant army of Russia accepted the Bolsheviki principles. When the victorious allies forced Germany to sign armistice terms late in 1918, a revolution took place in Germany similar to the one in Russia. It was apparent that the principles of the Bolsheviki had penetrated into German thought, and there were indications that the country might suffer from the same anarchy as prevailed in Russia. Furthermore, a revolutionary spirit seemed to be sweeping over the rest of Europe and conservative elements in all countries were confronted with the possibility of the disruption of organized society by Bolshevism.

In the United States early in 1919 there were serious attempts in several large cities to establish local soviets. These were fostered by men owing no allegiance to the republic, as in almost all cases they were subjects of European powers where Bolshevism was working for the mastery. Prompt arrests and deportations made it evident that

anarchy could not prevail over law and order.

Bolshevism a Social Plague. Plagues sometimes follow destructive wars, and not all of them are plagues which afflict the individual physically. They may be plagues which afflict the mass mentally, affect it politically, taint it spiritually.

Bolshevism is a social plague of this character. It found in Russia several things which made Russia its birthplace. One was a simple form of government, the soviet existing even under the czar, which had points of resemblance to a New England town meeting. It found also credulity, illiteracy, simplicity of character, and a profound sense of injustice resulting from oppression.

Bolshevism asserts that the people who work with their hands shall rule the people who do not and that the people who work with their brains shall not, because they have brains, obtain an advantage from that fact, whether it be an economic, political or social benefit.

Therefore, not only is a person who has acquired property or a competence because of intelligence or education a menace to the Bolshevist republic, but a person who, having intelligence and education, might, because of them, obtain anything, also is a menace. The Bolshevist theory is that all distinctions of intelligence must be eliminated —by shooting the intelligent, if necessary— in order that the unintelligent may possess what should be theirs—which is everything.

BOLTON, *bole'ton*, or **BOLTON - LE-MOORS**, ENGLAND, a manufacturing town of Lancashire, ten miles northwest of Manchester, on the River Croal. The city is divided into two parts. The most important public buildings are the town hall, the market hall and Saint Peter's Church. There are six free public libraries and four public parks. Bolton is one of the chief cities in England in the manufacture of cotton goods, and it contains some of the largest cotton mills in the world. It was the home of Arkwright, whose inventions were so important to the spinning industry. There are also numerous foundries, engineering works, chemical works, and collieries. Population, 1911, 180,885.

BOMB, *bom* or *bum*, a large, hollow iron ball or shell, filled with explosive material and fired from a mortar. The charge in the bomb is exploded by means of a fuse filled with powder and other inflammable materials, which are ignited by the discharge of the mortar. A piece of tubular gas pipe filled with explosives and fitted with a percussion cap forms a destructive form of bomb sometimes used by anarchists and other rioters. Bombs called *grenades*, which were thrown by hand, were extensively used in the World War.

BOMBARDIER, *bom bur deer'*, **BEETLE**, a small ground beetle which has a remarkable power of discharging at its pursuers an offensive secretion, which burns and leaves a stain like nitric acid.

BOMBARD'MENT, an attack on a fort, city or other field position by continued fire from big guns. Before the World War bombardment of positions having strong fortifications was as costly to the besiegers as to the defenders, but the great European struggle changed all preconceived ideas of the effects of such attacks. In their drive through Belgium early in 1914 the Germans quickly demolished the supposed impregnable forts before Liége and Antwerp, using guns of power hitherto unknown. Artillery bombardment assumed a highly important place as the war progressed, for it was found that the strongest trenches, dugouts, wire entanglements, etc., could be wiped out by prolonged and concentrated gunfire. In that conflict big guns were used in vastly greater number than in any preceding struggle. The Germans also perfected a long-range gun which bombarded Paris from a distance of seventy-six miles. This was first employed in the great offensive of 1918.

Air Bombardment. Attacks from the air by aeroplane flotillas and Zeppelins were carried on extensively during the World War. London, Paris, Venice and other cities of the allies were repeatedly bombarded by attackers who dropped bombs from the air, and the allies retaliated with fierce air raids on important munition-making centers in Western Germany. In 1918 preparations were made to protect the people of New York from a possible air raid on that city, from German airships which it was feared might be transported across the ocean on submarines.

BOMBAY, *bom ba'*, one of three great divisions of British India which politically are called presidencies, the others being Madras and Bengal. A presidency, in this sense, is a province whose executive authority is entrusted to a council presided over by the governor, who is known as its presi-

dent. That of Bombay is headed by the governor, as president, and two members of the Indian Civil Service; the three are appointed by the Crown. There is a legislative body of forty-eight members. Under the governor in council are four commissioners, each in charge of a large district. Nominal control over the native states is in charge of agents who are responsible to the commissioners.

The Bombay presidency stretches along the western coast of British India, and contains 184,000 square miles of territory, nearly the area of Ohio. Indiana, Illinois and Michigan. Two-thirds of it is under the direct control of the British Indian government, the remainder comprising native states with their own ruling princes, subject to British authority. Without exception the native governments are loyal to the Crown. The outbreaks of 1919 were not sanctioned.

The climate of Bombay is hot. The capital city, also named Bombay (which see) is in the same latitude as the Hawaiian Islands, Mexico City and Southern Cuba, but none of these sections is so warm as most parts of the presidency. A temperature of 125° is not unusual, and for weeks at a time 95° in the shade is common. There are four main physical divisions: The northern part, called the Sindh, has a low, generally unproductive surface; south of this is a section of well-watered, highly-productive country; there is a western mountainous region, traversed by the Ghats, and in the south is the plateau of the Deccan, where rainfall is slight.

That part of the province which is fertile is under intensive cultivation; at least three-fourths of the people are engaged in agricultural pursuits. There is considerable wheat on the uplands, vast quantities of rice and cotton, and a fair yield of spices. Except building stone and salt there is no mineral production. The manufactures are practically limited to cotton and silk fabrics.

In 1911 the population of the presidency was 19,672,642. About ten out of twelve of the natives are illiterate, though the British are remedying this defect as rapidly as possible. Educational progress is slow, because of the dense population and the poverty of the masses. The fine capital, Bombay, has over a million people; Ahmedabad has 215,835; Poona, 158,856; Karachi, 151,903; Surat, 114,868. No other city has 100,000 people. There are four main languages among the natives, and a number of dialects. See INDIA.

BOMBAY, one of India's finest cities, the capital of the British presidency of Bombay (see above). The name is from the Portuguese, and means *good harbor*. It is the chief seaport on the western coast of British India, and has two water fronts, for the city proper occupies an island twenty-two square miles in extent. It is one of the finest ports in the world. Causeways connect the island with the mainland, so there is practically within one municipality a vast industrial and residence area.

Bombay and Calcutta, at opposite sides of the peninsula, are commercial rivals. The map explains in what respects each excels. Bombay, hundreds of miles nearer Europe, leads in foreign commerce; Calcutta leads in coasting trade and is a larger center of distribution.

The city has one of the world's finest railroad terminal stations, a government dockyard covering 200 acres, and miles of docks and ship basins. One new dock, completed in 1915, has a drydock 1,000 feet long. The business section reminds one of a European city; in size and modern appointments only Calcutta among India's cities possesses as fine structures. There is a Chamber of Commerce, a great library, English and native theaters, a medical college and well-equipped hospitals. In this city people of all nationalities meet; in few other places is there such a mingling of Bengalis, Afghans, Sikhs, Rajputs, Chinese, Japanese, Malays, negroes, Siamese, Singhalese, Parsees, Tibetans and Europeans. The Parsees (which see) comprise the smallest section of the native population, but they are the most influential.

The manufactures of Bombay are principally cotton products; the city is a great exporter of cotton and cotton goods. In addition to this industry there are manufactures of pottery, brass utensils and carved woods; the tanning and dyeing interests are important.

Along the coast the average temperature is 79°, and the rainfall is about seventy-five inches a year. Therefore Bombay suffers less from excessive heat than does the Bombay presidency as a whole. The population in 1911 was 979,445, an increase of twenty-six per cent in ten years. In 1919 the estimated population was 1,155,000.

BOMBAZINE, *bom ba zeen'*, a mixed tissue of silk and worsted, the first forming the warp, and the second the weft. It is fine and light in the make, and may be of any color, though black is most in use. Since 1816 it has been manufactured extensively in Norwich, England. In America bombazine was once used widely as a mourning fabric, but its popularity has declined.

BONA FIDE, *bo'nah fi'de*, a Latin term which is used in law in the sense of honesty or without deception. It means, literally, *in good faith*. The term is used in connection with contracts, purchases, sales and other legal transactions.

BONAN'ZA (Spanish for *fair weather* or *favoring wind*), is a term applied in mining districts of the United States to an abundance of precious metal or rich ore in a mine. The Comstock Lode in Nevada was the first mine to receive the appellation. The term is now also applied to any good fortune or successful enterprise.

BONAPARTE, *bo'na pahrt*, the French form which the great Napoleon was the first to give to the original Italian name *Buonaparte*, borne by his family in Corsica. As early as the twelfth and thirteenth centuries there were in Northern Italy families of this name, members of which received some distinction as governors of cities or envoys. The connection between the Corsican Bonapartes and these Italian families is not clearly established, though probably the former were descended from a Genoese branch of the family, which transplanted itself about the beginning of the sixteenth century to Corsica, an island then under the jurisdiction of Genoa. From that time the Bonapartes ranked as a distinguished patrician family of Ajaccio. About the middle of the eighteenth century there remained three male representatives of this family at Ajaccio, the Archdeacon Lucien Bonaparte, his brother Napoleon and the nephew of both, Carlo, the father of the emperor Napoleon I.

Carlo or Charles Bonaparte (1746–1785) studied law at Pisa University, and on his return to Corsica, married Letizia Ramolino. He fought under Paoli for the independence of Corsica, but when further resistance was useless he went over to the side of the French and was included by Louis XV among the Corsican families who were to have rights in France of nobility. In 1777 he went to Paris, where he resided for several years, procuring free admission for his second son Napoleon to the military school of Brienne. He died at Montpelier. By his marriage with Letizia Ramolino he left eight children.

Jerome Bonaparte (1784–1860), youngest brother of Napoleon I, was born at Ajaccio. He was educated in the college of Juilly, and afterward became a naval lieutenant. He was sent out on an expedition to the West Indies, but the vessel, being chased by English cruisers, was obliged to put in to New York. During his sojourn in America Jerome Bonaparte became acquainted with Elizabeth Patterson and married her in spite of the protests of his brother. Two years later he separated from her at Napoleon's command, but a son born to the couple founded an American line of Bonapartes. After considerable service, both in the army and navy, Jerome was created king of Westphalia in 1807 and was forced to marry Catherine, Princess of Württemberg.

His government was not wise or prudent, and his extravagance and his brother's increasing exactions nearly brought the state to financial ruin. The Battle of Leipzig put an end to Jerome's reign, and he was obliged to take flight to Paris. He remained faithful to his brother through all the events that followed till the final overthrow at Waterloo. After that, he resided in different cities of Europe but latterly chiefly at Florence. In 1848 he was made a marshal of France and president of the Senate. Of Jerome Bonaparte's second marriage two children remained, Prince Napoleon Joseph, who assumed the name of Jerome, and the Princess Mathilde.

Joseph Bonaparte (1768–1844), the eldest brother of Napoleon I, was born in Corsica and was educated in France at the college of Autun. He returned to Corsica, in 1785, studied law, and in 1792 became a member of the new administration of Corsica, under Paoli. In 1793 he emigrated to Marseilles and married the daughter of a wealthy banker there; and later, with the rise of his brother to fame after the brilliant campaign of Italy, Joseph began a varied diplomatic and military career. At length, in 1806, Napoleon made him king of Naples, and two years afterward transferred him to Madrid as king of Spain. His position there, entirely dependent on the support of French armies, became almost intolerable; he was twice driven from his capital by the approach

of hostile armies, and the third time, in 1813, he fled, not to return. After the Battle of Waterloo he went to the United States and lived for a time near Philadelphia, assuming the title of Count of Survilliers. He subsequently went to England, and from there to Italy, where he died.

Louis Bonaparte (1778–1846), second younger brother of the emperor Napoleon I, and father of Napoleon III, was born in Corsica. He was educated in the artillery school at Chalons, accompanied Napoleon to Italy and Egypt and subsequently rose to the rank of a brigadier-general. In 1802 he married Hortense Beauharnais, Napoleon's stepdaughter, and four years later, in 1806, was compelled by his brother to accept the Dutch crown. He exerted himself in promoting the welfare of his new subjects and resisted as far as possible the tyrannical interference and arbitrary procedure of France; but he abdicated in 1810. From this time on he lived chiefly in Rome and in Florence. He died at Leghorn.

Lucien Bonaparte (1775–1840), Prince of Canino, next younger brother of Napoleon I, was born at Ajaccio. He emigrated in 1793 to Marseilles, where he distinguished himself as a republican orator and politician. After receiving an appointment in the commissariat at Saint Maximin, he married Christine Boyer, the daughter of an innkeeper there. After Robespierre's fall he was in some danger, but his brother's influence operated in his favor, and by 1798 he was settled in Paris and a member of the newly elected Council of Five Hundred. Shortly after Napoleon's return from Egypt, Lucien was elected president of the Council, and in this position he contributed greatly to the fall of the Directory and the establishment of his brother's power. In the next year he fell into disfavor and was sent out of the way as ambassador to Spain. Eventually, when Napoleon had the consulate declared hereditary, Lucien withdrew to Italy, settling finally at Rome, where he devoted himself to the arts and sciences and lived in apparent indifference to the growth of his brother's power. He came to France, however, and exerted himself on his brother's behalf, both before and after the Battle of Waterloo. Returning to Italy, he spent the rest of his life in literary and scientific researches. Pope Pius VII made him Prince of Canino.

Napoleon Bonaparte. See NAPOLEON I.

Charles Joseph Bonaparte (1851–) was the son of Jerome Bonaparte and Elizabeth Patterson. He was graduated from Harvard University and the school of law, and later attained distinction as a lawyer. In 1905 President Roosevelt made him Secretary of the Navy and from 1906 to 1909 he was Attorney-General.

BONAR LAW. See LAW, ANDREW BONAR.

BOND, an obligation in writing to pay a sum of money, or to do or not to do some particular thing specified in the bond. The person who gives the bond is called the *obligor;* the persons receiving the bond is called the *obligee.* No person who cannot legally enter into a contract can become an obligor, though such a person may become an obligee. No particular form of words is essential to the validity of a bond. Bonds are of two classes: they are *simple,* where a simple promise is made; *conditional,* where a promise is made to be fulfilled in a case a certain other condition is not fulfilled.

Bonds as Notes. A common form of bond is that on which money is loaned to a company or corporation, and by which the borrower is bound to pay the lender a certain rate of interest for the money. A private corporation, a city, a state or a nation may be in need of a large sum of money. This it secures by issuing bonds and selling them to investors. A bond simply says that the issuing authority promises to pay the face value of the bond, on a definite date, besides a fixed rate of interest each year until maturity. Bonds may run for any length of time, but in ordinary practice longer than twenty or thirty years is unusual. Though bonds were formerly issued only in large denominations, $500 and $1,000, a growing demand for those which would appeal to the small investor has gradually led to the issue of smaller denominations, usually $100. New York City recently issued bonds in denominations of $10. These bonds for small amounts are known among the brokers as "baby bonds."

There are two kinds of bonds, *mortgage bonds* and *debenture bonds.* A mortgage bond is, as the name implies, a direct lien on the company's assets, or on some special part of the assets designated in the bond. For example, a railroad will issue bonds which are a lien on one of its subsidiaries or on one of its divisions. A *debenture* bond is a promise, under seal, to pay a certain amount. It is merely the note of the corporation, without

the characteristics of a mortgage. Debenture bonds are usually payable in a few years, whereas mortgage bonds run for a longer period.

In all cases, bonds are the primary obligation of a corporation. No dividends can be paid on either preferred or common stock until the interest on the bonds has been paid. If the interest is not paid it is said to be *defaulted.*

Registered and Coupon Bonds. Bond advertisements frequently state that "these bonds are sold with the privilege of registry." The owner's name, the serial number of the bonds and the amount are then registered on the company's books. Registered bonds may be transferred by giving proper notice to the secretary of the company, who makes the necessary changes in the book known as the *register. Coupon bonds* have certificates of interest, or *coupons,* attached, which state the amount of interest due. These coupons are to be cut off when the interest date arrives and are presented for payment. Usually any bank, on receipt of the coupons, will pay the interest to its customers and will in turn collect from the corporation or governmental unit which issued the bonds.

Government Bonds. Bonds issued by a national government are not protected by mortgages, as no citizen can sue a nation for debt. The investor in a government bond loans his money in the belief that if the government survives his investment is safe, for back of the loan are the entire resources and the good faith of the nation. So confident of ample security are capitalists that on several occasions the United States has floated loans in peace times at two and two and one-half per cent interest. During the World War, when loans of stupendous amounts were needed, the interest rates were higher. See Liberty Bonds.

Popularity. The popularity of bonds is easily explained, for two reasons. First, their comparative safety appeals to people who cannot afford to lose their savings. Not all bonds, of course, are safe; the bonds of a bankrupt company are not much better than its stock. The second reason appeals to the seller of the bond; a company in need of money thus borrows money without the necessity of giving outsiders a voice in the management. In the case of cities and other governmental divisions, the taxes would be suddenly raised if bonds could not be sold to meet large necessary expenditures; if a city could not borrow money it would have to raise the necessary amount by taxation within a year or two, to the great inconvenience of the taxpayer.

Bonds are now issued to raise money for almost every conceivable purpose. Street car lines, railroads, telephone and telegraph companies, and many private enterprises, including small manufacturing enterprises and incorporated retail stores, have borrowed money in this way. Public schools, new and improved highways, bridges, canals and irrigation ditches, waterworks, lighting plants, parks, bathing beaches—these are some of the many public improvements whose cost has been met by the issue of bonds. In fact, the expenses of nearly all public improvements are now met by bond issues.

BONE, a hard material constituting the framework of mammals, birds, fishes and reptiles, and protecting vital organs, such as the heart and lungs, from external pressure and injury. Bones are hard on the outside, and are covered with a protecting membrane called *periosteum.* The internal parts of the bone are more cellular, the spaces being filled with marrow, a fatty tissue supporting fine blood vessels. The bones of an adult consist of nearly thirty-four per cent animal material and sixty-six per cent mineral substances, chiefly phosphate and carbonate of lime. The animal material may be shown by placing a bone in weak acid, which will dissolve the mineral matter and leave the bone so that it can be easily bent. The animal matter is destroyed by burning, leaving the bone brittle and easily crushed.

Because the bones of children contain a smaller proportion of mineral matter they are less brittle than those of adults, and are not so easily broken. On the other hand they are more flexible and may become misshapen if attention is not paid to proper sitting and standing positions.

Bones, from the quantity of phosphates they contain make a good fertilizer. The value of bone as such is increased by boiling out the fat and gelatin, the removal of which makes the bones more readily acted on by the weather and hastens their decay; by the distribution of their parts by grinding them to dust, and by dissolving them in sulphuric acid to render the phosphate soluble in water. Before being utilized in agriculture they are often boiled for the oil or fat they

contain, which is used in the manufacture of soap and lubricants.

The bones of the adult body are pictured and named in a full-page illustration accompanying the article Skeleton.

BONEBLACK, IVORY BLACK, or **ANIMAL CHARCOAL,** a substance obtained by heating bones in close retorts till they are reduced to small, coarse grains, after which the charcoal is reduced to powder by crushing between rollers. Boneblack possesses the valuable property of arresting and absorbing into itself the coloring matter of liquids which are passed through it. Hence it is extensively used in the process of sugar refining, in which cylinders of large dimensions filled with this substance are used as filters. After a certain amount of absorption the charcoal becomes saturated and ceases to act. It has then to be restored by reheating or other methods. Boneblack has also the property of absorbing odors, and may thus serve as a disinfectant of clothing and apartments.

BONESET, *bone'set,* or **THOR'OUGHWORT,** a useful annual plant, native to America, easily recognized by its tall stem, four or five feet in height, passing through the middle of a large, double, hairy leaf, and surmounted by a broad, flat head of light purple flowers. An infusion of it is much used in domestic medicine as a tonic and for causing perspiration.

BONHEUR, *bo nor',* Marie Rosa (1822–1899), a distinguished French artist and painter of animals. In her particular field she has surpassed all other women painters. When only eighteen years old she exhibited two pictures, *Goats and Sheep* and *Two Rabbits,* which gave clear indications of talent. Among her famous canvases are *Plowing in Nivernais,* now in the Louvre; *Haymaking* and *The Horse Fair,* now in the Metropolitan Museum of Art, New York. It was placed there by Cornelius Vanderbilt, who paid $55,000 for it. In 1865 she was honored by Empress Eugénie, receiving the Cross of the Legion of Honor.

BON HOMME RICHARD, *bo nom' re-shahr',* the flagship of John Paul Jones in his victory over the English sloop *Serapis,* September 23, 1779. With the aid of the French government, Jones had collected a small fleet, and in cruising about the English coast had captured many prizes. September 23, sighting a British fleet of merchantmen under consort of the *Serapis* and the *Countess of Scarborough,* he gave battle. The main contest was between the *Richard* and the *Serapis,* during which Jones lashed the two boats together and precipitated a fearful hand to hand fight. After several hours, the British ship surrendered, but the *Richard* was so badly damaged that it sank. The victory was important in winning foreign respect for the American navy. See Jones, John Paul.

BON'IFACE, the name of nine Popes, of whom only three are conspicuous in history. Boniface II (530–532) was the first Pope to assume the title of Universal Bishop of Christendom. Boniface VIII (1294–1303), Benedetto Gaetani, born at Anagni, was the greatest Pope of the name. His inauguration was distinguished by unusual pomp and ceremony. In 1296 the Pope issued his famous bull *Clericis Laicos,* in which he forbade the payment or collection of taxes on ecclesiastical property without the consent of the Holy See. In 1300 he instituted the Roman Jubilee, and in 1302 he issued the bull *Unam Sanctam,* proclaiming the subjection of the temporal to the spiritual power to be an article of faith necessary to salvation. Boniface IX (1389–1404), a native of Naples, successor to Urban VI, acquired almost absolute power in Rome.

BONIFACE, Saint (680–755), (original name, Winfrid), a celebrated English missionary, sometimes called the Apostle of Germany, born at Kirton, Devonshire, of a noble Anglo-Saxon family. He labored among the Frisians and German tribes. In 722 he was made bishop and ten years later archbishop. About 743 he founded the Abbey of Fulda, and for ten years, beginning in 744, he was Archbishop of Mainz. He is said to have enforced his missionary teaching by cutting down, with his own hands, the sacred oak at Geismar. Saint Boniface was murdered by some Barbarians and was buried in the Abbey of Fulda. His festival is celebrated in both the Roman and Anglican churches on June 5th.

BONITO, *bo ne'to,* a name applied to several fishes of the mackerel family, one of which, the bonito of the tropics, or *stripe-bellied tunny,* is well known to voyagers from its persistent pursuit of the flying-fish. It is a beautiful fish, steel blue on the back and sides, silvery on the belly, with four brown longitudinal bands on each side. It grows to a length of two and a half feet and is good eating, though rather dry.

BONN, GERMANY, an important city in Rhenish Prussia, situated on the left bank of the Rhine, about five miles southeast of Cologne. The scenery and surroundings of Bonn are very beautiful and attract tourists from all over the world. The chief buildings are the Münster church, in the late Romanesque style, the Rathaus, the Beethoven House, where the composer was born, and the buildings of the university. Bonn was long the residence of the electors of Cologne and finally passed into the hands of Prussia by the arrangements of the Congress of Vienna in 1815. Population, 1910, 87,978.

The University of Bonn was established in 1818 by Frederick William III, king of Prussia. Next to the University of Berlin, Bonn is considered the leading German university. Its faculties embrace those of theology, law, medicine and philosophy. In peace times it has a student enrollment of over 4,300. The library contains 360,000 volumes, besides a large number of manuscripts. The medical department embraces laboratories, a physiological institute and clinics. The university also has a celebrated observatory.

BONNET-ROUGE, *bo na'roozh'*, meaning *red cap*, was a headdress worn during the French Revolution by every one who wished to be considered a true patriot. It was regarded as the emblem of liberty, being called the *cap of liberty*. The name was also applied to the Revolutionists themselves.

BO'NUS, a special monetary payment beyond the agreed amount. It is given employes in addition to their salaries or wages out of excess profits, as a matter of justice as one form of profit sharing, or it may be in the form of an extra dividend on stocks on which only a certain per cent has been guaranteed as a return on investments. See PROFIT SHARING.

BOOBY, a swimming bird, named from the extraordinary stupidity, or apparent stupidity, which it shows in lighting on ships and allowing itself to be caught. Some say, however, that it is merely slow in moving because of its heavy wings; others insist that it is so seldom in contact with man that it has not learned to fear him. The name is taken from the Spanish word for *idiot*. The booby lives on fish, which it takes by darting down upon them when they are swimming near the surface of the water. Its lower jaw and throat are naked and in one species are colored blue.

BOOK. Books as we know them to-day are a product of the modern period. It was late in the Middle Ages (about 1450) that John Gutenberg perfected his invention of printing from movable types, and revolutionized the whole field of bookmaking. Before his time mankind had used various devices for the preservation of written records. The Egyptians engraved inscriptions on stones, on the walls of their monuments and on columns; the Assyrians pressed theirs upon tablets, which were hardened by baking; the Greeks and Romans used tablets of ivory, metal or wood. When tablets of wood were used, they were coated with wax on one side and on this wax, letters were traced with a stylus. Two such tablets, joined together at the back with wires, are the earliest arrangement which resembles the modern book. A raised margin was left around the edge of the wooden tablets to prevent the wax from rubbing.

As people became more advanced and felt greater and more constant need of expressing themselves in writing, a more convenient material was found absolutely necessary, and the papyrus plant of the Egyptians furnished the first flexible writing material of any importance. The papyrus was written on with reeds dipped in gum water colored with soot, and various other decoctions which were used as ink are mentioned by ancient writers. The next material employed was a parchment made from the skins of sheep. The pieces of parchment or papyrus were joined together, when a composition of any length was to be set down, and the entire sheet was wound about a stick in the form of a roll. This was called a *volumen*, and from this comes our word *volume*. Many of these rolls of papyrus, most of them in a good state of preservation, have been found in the coffins with embalmed bodies in Egypt.

Paper made from cotton came into use about the end of the ninth century and checked the total destruction of old manuscripts, many of which were being erased that the parchment on which they were written might be used again. As linen paper became common in Europe the first real im-

petus was given to the production of books. The quality of the paper was poor, it was brownish in color and thick and rough, but many of the books produced at this time are marvels of skill and beauty. The writing was all done by hand, and the writers were, for the most part, monks, many of whom spent all of their time in copying. The full story of these interesting productions is told in these volumes in the article MANUSCRIPT.

Modern Bookmaking. After Gutenberg gave his invention to the world reading became much more general, but it was several years before books were cheap enough to circulate among the common people. The first printed books were copies of the Bible and other religious works, but these were soon followed by reproductions and translations of the Greek and Roman classics. Many features of the modern book were lacking, such as the title page, the date of publishing, and the publisher's name. These early books, too, were large and cumbersome, and had leaves of coarse, thick paper.

About the beginning of the sixteenth century books of more convenient size began to circulate, and title pages became common. Pasteboard was used in the binding, thinner paper made its appearance, and though the printing was very faulty, the outside was often beautifully ornamented. In the course of time glazed cloth came into use as a covering for the sides of books. Great advance was made in all phases of bookmaking during the nineteenth century, and printing at last became a real art. A recent development is the use of thin *India paper* for leaves, which permits the issuing of Bibles and long novels like those of Dickens in small, compact volumes. A slightly heavier grade of paper, but one much thinner than ordinary paper, is used by publishers of some encyclopedias, to eliminate the heavy, cumbersome volume formerly in circulation.

The mechanical processes involved in bookmaking are explained elsewhere in these volumes under the headings BOOKBINDING, PAPER, PRINTING and PRINTING PRESS.

The Book Trade in America. The printing business in America prospered from an early period, and it owes much to that sturdy pioneer, Benjamin Franklin. For many years, however, the business was confined principally to the reprinting of imported books, especially those by English authors. With the general development of the country American books began to be published in increasing numbers, and since 1890 the output has multiplied by leaps and bounds. Popular "sellers" run through many editions, and a publisher may market a million copies of a book that catches the public fancy. In 1910, 13,470 titles of new books were recorded in the United States. That was an unusual year, however. The outbreak of the World War four years later had a depressing effect, reducing the number of titles to 9,734 in 1915. The next year showed an increase to 10,445, chiefly because general interest in the war caused the production of many books relating to the great conflict. It is a notable fact that books of fiction, which predominated prior to 1910, have since that date showed a gradual decline. In 1917 and 1918 fewer books were published, owing to scarcity of paper. The total number of copies of books and pamphlets issued each year runs into hundreds of millions. Fully two-thirds of books now published in the United States are by American authors.

The reader will find detailed suggestions on reading in the article Reading.

BOOKBINDING, the art of fastening together the pages of a book and enclosing them in a case, called the cover. The first step in binding a book consists in folding the sheets. In small binderies this is done by hand, but in all of the larger establishments it is done by machinery. The separate sheets are fed into the folding machine either by an operator or by automatic feeders. The folder folds and presses the paper in the order necessary to bring successive pages opposite one another. The next step consists in arranging the folded sheets, called *signatures,* in order to constitute the book. In large binderies sheets of the various signatures are placed together in piles on a large revolving table, the piles being laid in the order of their signature numbers, as 1, 2, 3, and so on. (See the bottom of every sixteenth page in this volume.) Girls sit around this table, and as it revolves each one takes a sheet from each pile as it comes opposite her. In this way by one revolution of the table as many books are placed together as there are girls to collect the sheets. This process is called *gathering.*

After being gathered the sheets are pressed together in a strong press, where they remain for some hours. After their removal from this press the packages are ready for

sewing. There are two processes here employed. The common practice is to sew the various signatures together with linen thread through the back, employing an intricate sewing machine. A book thus sewed is a "machine-sewed" book. By the second process, resulting in what is known as a "hand-forwarded" book, each book is creased across by a saw made for the purpose, the books containing from three to five creases, according to its size. Large strong cords or tapes are fastened in these creases, the ends being left three or four inches long. The leaves are sewed to these cords and in this way the book is fastened together.

After sewing by either process, the back is covered with a thick coating of glue and paste. When this is dry, the book is placed in a press resembling a vise, and is hammered to round the back. This press contains boards, over the edge of which the folded edges of the sheets are slightly bent in the hammering, thus forming a ledge in which the cover of the book rests.

The book is now ready for the cover or case. This is put on in two ways. If the book is bound in leather, the boards forming the cover are first fastened to the book. This is done by raveling or scraping the ends of the cords to which the leaves have been sewed and gluing these to the boards, in case of the hand-bound book, or strong cloth is pasted along the back, with a strip projecting to be pasted upon the cover, to fasten book and cover firmly together. The cover is then lined with white or colored paper and whatever lettering is necessary is put upon the cover, then the cover is pasted to the book, and the book is placed in press and allowed to dry. If a cloth cover or case is used, this is made complete before it is fastened upon the book. The method of fastening is practically the same as that used with a leather cover, and the finishing is done in the same way.

The edges of the book are treated in various ways. Before the cover is put on, the books are placed in a cutting machine, where the edges are trimmed. These may be left plain, or they may be sprinkled, by placing them under a sieve over which a brush containing coloring matter is drawn; they may be feathered, by dipping them in a tank of water on the surface of which coloring matter has been spread to form the desired pattern, or they may be gilded, which is done by treating the edges with a solution of white of egg and water and then laying on gold leaf. When dry, the gold leaf is burnished and furnishes the beautiful gilt appearance which is seen on many high-priced books. Uncut edges are preferred for many books. This usually means that the books are trimmed at the ends, but that the front edge of the leaf is left as it was formed by folding.

Styles of binding are denoted by different names. A *leather-bound* book is one which is wholly covered by leather, as an unabridged dictionary or most law books. A *cloth-bound* book is one that has the sides and back covered with cloth. This style of binding is by far the most common. A *half-leather* has the back and corners of leather and the boards covered with cloth. The head binding is a cord or tape fastened to the ends of the back for the purpose of improving the appearance of the volume. When such an addition is made it is put on before the cover is fastened to the book.

The hand-made books which were produced before the art of printing was invented were very expensive, and the bindings corresponded with the work on the book. The covers were usually of boards, which were often covered with leather that was highly ornamented, and they were also held in place by metallic hinges bearing engraved designs or other ornaments. Metallic clasps of gold and silver were also often used to fasten the book together, and these might contain rich settings of jewels and other gems. But when the art of printing made books cheaper and more readily accessible, the style of binding was changed accordingly, so as to reduce the price of the book. See Book.

BOOKKEEPING, the science of accounts, or the method by which business transactions are recorded and classified. Not only does careful bookkeeping show daily the condition of each individual account in which a company is interested, but a summary of all accounts shows the actual condition of the business as a whole.

Single-Entry Bookkeeping. Briefly stated, any system which accurately shows the balance between all the debits of a business and all its credits may be called a system of bookkeeping. Such a system is quite simple, but it can be used only for a very small business. Accountants have named such a system *single-entry* bookkeeping.

In single-entry, as the name implies, there

is but one entry for each transaction. If John Jones buys on credit a barrel of flour at $12, the merchant puts a $12 debit in John Jones' account; he makes no entry to the account of flour, or merchandise. When the account is paid he merely puts a record of $12 to the credit of John Jones, and makes no entry in his principal book, the ledger, of the cash received. The person who keeps such a set of books is able only to know whether more money is due to him than he owes to other people. He needs only a *day book,* in which a statement of each transaction is recorded, and a *ledger,* in which all transactions with each person from whom he buys or to whom he sells are brought together, under debit and credit columns. Sometimes a *cash book* is also kept, but this is not essential.

Double-Entry Bookkeeping. Bookkeeping by double-entry gives a much more accurate and complete record of the business. The key to its essential feature is the word *double,* which indicates that every transaction must be entered in two places, in a debit column and a credit column. No matter how large the business nor how many thousand transactions are recorded, the sum of the debit entries always equals the sum of the credit entries; always there is a perfect balance.

The books used are a *day book,* a *journal* and a *ledger.* In the day book, details of every transaction are entered as they occur. These amounts are then transferred to the journal, being entered opposite the names or titles of the ledger accounts which are concerned. That item in the day book which has cost something, or which the trader has received, is put in the debit column, and that which produces something, or with which the trader has parted, is placed in the credit column. For instance, if a person has bought a suit of clothes for $15 he would credit cash for $15 and would debit expense $15.

The various items in the journal are then transferred to the ledger, or *posted,* all accounts of the same nature, as clothing accounts, cash accounts, grocery accounts, being placed together and debited or credited according to their nature, as shown by the journal. Thus, on the page marked *Cash* in the ledger, for the transaction noted above, $15 will be entered in the credit column; on the page marked *Expense* $15 will be entered in the debit column.

In a large business the *Cash* account in the ledger contains only totals carried from the *cash book.* Manifestly, since every item must be posted in some form on both the debit and the credit column of the *journal* and must be transferred accordingly to the *ledger,* all the debit items in the *ledger* must equal all the credit items. An examination to determine whether this is true is known as *taking a trial balance.* This, in a general way, will tell whether the entries have been accurately made. Often other books are used in double-entry bookkeeping to afford means of checking particular phases of the business by themselves; such are the *stock book, cash book, bill book, invoice book, account sales book,* each one including entries concerning only its particular subject. For instance, the cash book will show the income and outgo of cash and of nothing more, being retained as an absolutely accurate test of this part of the business.

Qualifications of a Bookkeeper. No young man or woman should prepare for a career as a bookkeeper without, first, a thorough course in arithmetic which has made it clear that the candidate has a liking for mathematical calculations. Second, if such qualities do not exist, there must be developed patience, perseverance, orderliness, accuracy. The bookkeeper must keep his books in balance to a cent—even an error of one cent may cause a search continuing for days. The salary of a bookkeeper averages well with other clerical places—is possibly better than most positions which carry no executive authority.

BOOK'PLATE, a printed or engraved label, pasted in or on a book to show its ownership. Such labels were used in the last quarter of the fifteenth century, and were usually hand-painted. Albrecht Dürer originated the engraved bookplate and the first dated specimen which we have was designed by him in 1516. The designs on these early bookplates usually consisted of the owner's coat of arms, with allegorical elements added. About a half-century after these first bookplates were known in Germany, bookplates were introduced into England, and it is here that they have been most widely used. The first English designs were copied from the German and contained coats of arms and mottoes. These were succeeded by the Chippendale style, which was lighter and more graceful, and this in turn by a still simpler design,

known as the ribbon and wreath. The first American bookplates came from England and were used by wealthy colonists. Within the last few years much interest has been shown in bookplates, and considerable literature about them has been produced.

BOOKS FOR READING. See READING.

BOOKWORM, a grub which feeds on the paste, binding and leaves of books. The grubs of several different beetles come in this class. They seem to prefer old books, and if unchecked will do great damage to valuable volumes. Bookworms can be killed by the fumes of carbon bisulphide.

A person who is excessively fond of reading is often called a "bookworm."

BOOM'ERANG, a missile used by the Australian aborigines and by some peoples of India. It is made of hard wood, and is of a peculiar curved shape, sometimes resembling a rude and very open V. The boomerang, when thrown as if to hit some object in advance, instead of going directly forward, slowly ascends into the air, whirling round and round to a considerable height, and returns to the position of the thrower. If it hits an object, of course it falls. The Australians are very dexterous with this weapon, and can make it go in almost any direction, sometimes making it rebound before striking.

BOOMERANGS

The word *boomerang* is commonly applied at the present time to an act or statement which reacts on the originator of it in such a way as greatly to embarrass him.

BOONE, DANIEL (1735–1820), a famous American pioneer, born in Bucks County, Pa. In his youth the family removed to the North Carolina frontier. Boone's education was limited to reading and writing, but he became skilled in woodcraft, and was the peer of any Indian in sagacity and fearlessness. In May, 1769, when he was thirty-four years old, he led a company of five men into the unknown wilds of Kentucky, built a fort called Boonesboro on the Kentucky River, and thither brought his family and about thirty volunteers. Boone was captured by the Indians and carried to Old Chillicothe on the Miami, where he was adopted by a Shawnee chief. Learning of an intended raid upon Boonesboro, he escaped (June 16) and reached home in four days, having but one meal during his journey. He found his family gone, but helped to repel the attack of the Indians. In 1780 he again brought his family to Kentucky, and he took a prominent part in the history of the territory till its admission to the Union in 1791.

The Battle of "Blue Licks," in which Boone's sons fought by his side, took place in 1782. In the first survey of the state the title to Boone's land was disputed, and in 1797 he moved to Missouri, then a Spanish province. There he received a grant of 8,000 acres of land. At the time of the Louisiana Purchase he again lost his land, but Congress granted him 850 acres. Enoch Boone, his son was the first white male child born in Kentucky.

In 1915, the Daughters of the American Revolution of North Carolina, Tennessee, Kentucky and Virginia completed the marking of a trail extending from Boone's home in North Carolina to Boonesboro, and traversing the four states mentioned.

BOONE, IA., in Iowa County, in the center of the state, is fifty miles northwest of Des Moines, on the Chicago & Northwestern, the Chicago, Milwaukee & Saint Paul and the Fort Dodge, Des Moines & Southern railroads. A cure for dandruff is manufactured here and marketed all over the world. There are also manufactures of brick and tile, cement blocks, hosiery and hardware specialties. The city has six and eight-story buildings. A new courthouse, completed in 1918, cost $200,000. Boone is the division headquarters of the first and third railroads named above and raiload shops of both roads are here. Population, 1910, 10,347; in 1917, 11,321 (Federal estimate).

BOOTH, the family name of two brothers who have a prominent place in American annals, one as a leading tragedian, and one as the assassin of Lincoln.

Edwin Thomas Booth (1833–1893) was the son of the English actor, Junius Brutus Booth (1796–1852). He was born at Belair, Md., and made his first stage appearance at

Boston in 1849. In his numerous tours in the United States and in Europe he was most enthusiastically received. He was particularly famous for his personation of Shakespearean characters—Othello, Richard III, Lear and Hamlet. Booth was of unimposing appearance, but was dignified and graceful, and he possessed a voice singularly flexible and capable of expressing any shade of meaning or feeling.

John Wilkes Booth (1839–1865), the younger brother of the great actor, inherited from his father a touch of insanity that rendered him erratic. During the Civil War his sympathies were for negro slavery, and early in 1865 he formed a conspiracy with others to murder President Lincoln and the principal officers of the government. On the evening of April 14, 1865, he entered Ford's Theater, in Washington, where the President was sitting in a private box, and shot him. Shouting *"Sic semper tyrannis,"* ("Thus be it ever to tyrants"), he leaped to the stage below, breaking his leg in the effort, and in the confusion escaped through a back door. Mounting a horse that was held in waiting, he fled to Virginia. Here he was concealed for a time by sympathizers; but, on being discovered in a barn, he refused to surrender and was shot.

BOOTH, a family which has been prominent in religious and social work in England and America.

William Booth (1829–1912), the founder of the Salvation Army, is the most famous of the Booth family. He was born at Nottingham, England, and was reared in the Episcopal Church, but after being converted in a Wesleyan chapel, he joined the Methodist Church and became a minister of that denomination. He was appointed to hold special evangelistic services in connection with his other work until 1861, when, being requested to settle in the ordinary circuit work, he resigned and began his career as an evangelist proper. In 1855 he married Miss Catherine Mumford, who proved an able helper until her death in 1890.

General Booth organized in London (1865) "The Christian Mission," which grew into the military organization rechristened in 1878 the *Salvation Army.* Under this name that useful organization has spread into many parts of the world and is widely known for the zeal and self-denial of its rank and file (see SALVATION ARMY). General Booth has published many hymns for the use of the Army, and it has gone forth "singing itself around the world." In *Darkest England,* published in 1890, General Booth outlined his plans for the suppression of poverty and vice. His sons and daughters were trained in the work and were associated with him in the Army. His son Bramwell succeeded him as its general.

Ballington Booth (1859–), the second son of General Booth, is known especially as the founder of the Volunteers of America (which see). He was born and reared in England, and from 1885 to 1887 had command of the Salvation Army in Australia. In 1886 he married Maud Charlesworth, and the following year he and his wife went to America to take charge of the Salvation Army in the United States and Canada. As they were unable to work in harmony with General Booth, they organized in 1896 the Volunteers of America, a society similar to the Salvation Army, but with a more democratic plan of organization. Ballington Booth is a writer and speaker of ability, and is the author of *From Ocean to Ocean.*

Maud Ballington Charlesworth Booth (1865–) was born near London, and was the daughter of a wealthy clergyman. At the age of seventeen she joined the Salvation Army and began at once to work actively in its interest in Paris, and later in Switzerland. In 1887 she married Ballington Booth and with him became a director and leader of the Volunteers in 1896. Mrs. Booth was especially successful in her work in behalf of prisoners, both during their confinement and after their release. She also attained a wide reputation as a lecturer and produced several books, of which the best known are *Branded* and *Look Up and Hope.*

Frederick Saint George de Latour Booth-Tucker (1853–) was the immediate successor of Ballington Booth as leader of the American Branch of the Salvation Army. He was born in Bengal, India, and held civil service positions in the Punjab before 1881, when he resigned to join the Salvation Army. The following year he established the Army work in India, and in 1891 became foreign secretary of the Army headquarters in London. He married Emma Ross Booth, a daughter of the General, in 1888, and since then has used the name Booth-Tucker. When Ballington and Maud Booth seceded from the Salvation Army he took up their work in

America, serving until 1904. In that year he returned to London, and in 1907 was appointed special commissioner for India and Ceylon. He wrote *Life of General William Booth* and *Life of Catherine Booth.*

BOOTS AND SHOES, coverings for the feet, in nearly all parts of the world made of leather. The term *shoe* applies to a covering for the foot alone; a *boot* covers the foot and lower leg. In some sections, as in Holland, where styles have remained unchanged for 300 years, wooden shoes are yet much worn, and in China hundreds of millions of people wear shoes of wood and cloth, sometimes expensively ornamented with needlework.

The present-day comfortable pair of boots or shoes represents a gradual development from simple, crude forms. The sandal is the simplest and oldest form of foot protector. It consists of a sole, attached to the foot by a leather thong. Uncivilized races made a shoe of a single piece of untanned hide, which was laced with a thong. From these simple styles more elaborate patterns were developed. The Egyptians, Greeks and Romans were familiar with the boot, and highly ornamented designs were often used by the royalty and nobility. Elaborate designs were also common in England during the fourteenth and fifteenth centuries. Those worn by the nobility became so fantastic and expensive that their styles were at one time regulated by the government.

Manufacture. For centuries all shoes were made by hand, and shoemakers came to America with the first colonists. For a long time in New England the shoemaker traveled from family to family and made shoes from such leather as each family had in its possession. When the country became more thickly settled, the shoemaker located in a small shop, and his customers came to him. The man who could make a pair of boots or shoes in a day was considered a first-class workman. The shoemakers then began to employ apprentices. After a time several makers combined their forces and set some workmen to cutting out the pieces for the shoes, others to sewing these together, others to fastening the uppers to the soles. It was found by this division of labor that more work could be accomplished and in a much more satisfactory manner. Factories were established before any machinery for the manufacture of shoes had been invented.

The first successful machine used in the manufacture of boots and shoes was the rolling machine, which took the place of the old lapstone and hammer for pressing the leather together and giving it a smooth, hard surface. This was followed by a sewing machine, which first sewed together the various parts forming the upper of the shoe. Pegging machines for fastening the soles to the uppers followed. These were of various patterns, first using pegs, then nails and later wire, for sewing, until the present welt machine was invented, which fastens the uppers to the sole in the present fashion.

Division of Labor. In no other industry is the division of labor more perfect than in the manufacture of boots and shoes. The ordinary shoe factory consists of three departments. The first is that in which the patterns or pieces are cut, this being done in some large factories by machinery, though by hand in many others. Next is the department in which the uppers are sewed together. This consists of a room containing a number of sewing machines arranged in line along a table or bench. Each machine does only one thing; one sews a certain seam and another makes button-holes. Thus the pieces pass on from machine to machine, until they pass from the other end of the table ready to be fastened to the sole. The third department is that where the soles are made and the soles and uppers are fastened together. The soles are cut by machinery and are shaped by being placed in heavy presses. The inner sole is then tacked to a *last,* over which the uppers are drawn and fastened to the sole. The outer sole is then tacked on, the last is removed and the shoe is sewed together on the sewing machine. After this the heel is put on by a machine that presses it into place and fastens it at the same time. The shoes are then sent to the polishing room, where they are finished, and the buttons are put on or the laces put in, as the case may require. They are then packed ready for shipment. Those of the best quality are wrapped in tissue paper, and each pair is packed in a box by itself, but the cheaper grades are packed in cases containing several dozen pairs each.

The New England states lead in the manufacture of boots and shoes, but large factories are found in Illinois, Missouri and other states of the middle West. The entire output of the country exceeds 300,000,000 pairs each year in peace times. American shoes are quite extensively exported to Europe.

HON. ROBERT LAIRD BORDEN

Rising Cost of Footwear. After the World War entered its second year, about midsummer of 1915, the shoe market, like the market for other commodities, was seriously affected. Each soldier in active service abroad needed from seven to nine pairs of shoes a year, and this increased demand from 2,000,000 combatants soon threatened the leather supply. When the United States entered the war in 1917 the first government order was for 2,000,000 pairs of shoes; this was followed soon by a second and subsequent orders for 5,000,000 pairs each time; 27,249,000 pairs were ordered in the first fourteen months of American participation in the war. Cost of footwear to civilians doubled within a year.

In Europe the situation was still more painful. Leather ceased to be used for shoes in Germany among civilians, and all kinds of substitutes, even paper, were employed. France, England and Italy, not deprived of imports, fared somewhat better.

BORACIC, ACID. See BORIC ACID.

BORAGE, *bur'aj,* a genus of plants having rough, hairy foliage and blue, drooping flowers. One species, a common plant, grows abundantly in waste places in the United States. It is used to give a coolness to beverages, in which its leaves are steeped, and was formerly thought to have the power of driving away care and making people happy. It belongs to the same family as the forget-me-not and bluebell.

BORAX, *bohr'ax,* is biborate of sodium. Pure borax forms large, transparent, six-sided prisms, which dissolve readily in water, give off water in dry air, and when heated melt in their water of crystallization, swell up and finally fuse to a transparent glass. Native borax has long been obtained, under the name of *tincal,* from India, the main source being a series of lakes in Tibet. As imported it is in small pieces of a dirty yellowish color and is covered with a fatty or soapy matter. Tincal, which contains various impurities, was formerly the only form in which borax was found, but other sources of borax, particularly in North and South America and in Germany, have been rendered available. Large quantities are manufactured from boric acid obtained in Tuscany, Italy (see BORIC ACID). America yields large quantities, there being rich deposits of borax and boracic minerals on the Pacific slope, especially in Death Valley.

Borax has a variety of uses. In medicine it is employed in ulcerations and skin diseases. It has valuable antiseptic and disinfecting properties, and it is now much used for the preservation of meat, fish and milk. In the laundry it is used to soften water, and various laundry soaps and powders contain it. It is also employed in soldering metals, in making fine glaze for porcelain, as it renders the materials more easily melted, in enameling and in making beads, glass and cement.

BORDEAUX, *bawr doh',* FRANCE, capital of the department of Gironde, and an important commercial city. As the center of the wine export trade in France, Bordeaux has long been famous. Shipbuilding is also an industry of first importance, and the city in peace times sends large fishing fleets to the Newfoundland Grand Banks. Bordeaux is situated on the Garonne, about seventy miles from the sea and 358 miles south-southwest of Paris. Because of its position in the interior, it was made the temporary capital of France early in the World War, when Paris was in danger of capture.

By the marriage of Eleanor, daughter of the last Duke of Aquitaine, to Henry II of England, Bordeaux was transferred to the English crown, but under Charles VII, in 1451, it was restored again to France. It has a great cathedral, Saint Andre, which dates from the eleventh century. Population, 1911, 261,678.

BORDEN, ROBERT LAIRD, SIR (1854–); a Canadian statesman, leader of the Conservative party, and Premier of Canada throughout the period of the World War. He was born at Grand Pre, Nova Scotia, and educated at Acadia Villa Academy, Horton. Borden was admitted to the bar in 1878 and was the head of the firm of Borden, Ritchie and Chisholm, Halifax, for a number of years. He was elected to the House of Commons for Halifax in 1896 and 1900; in 1904 he was defeated for Halifax but was elected for Carleton, Ontario, after Edward Kidd, member for Carleton, had resigned. At the next general election he was returned for Halifax, which he still represents. From 1901 to 1911 he was leader of the Conservative opposition and following the general election of 1911 he was made Premier, succeeding Sir Wilfrid Laurier. In 1912 Borden was appointed member of the Imperial

Privy Council, and in 1914 the honor of knighthood was bestowed on him.

When England entered the war against Germany the Canadian government pledged its full support to the mother country, and under Premier Borden's leadership the Dominion loyally aided the allied cause. In 1917 Parliament passed a conscription bill which the Laurier Liberals bitterly opposed because it would mean compulsory service for the French-Canadians, who were unwilling to fight for the allies. A general election followed in December, 1917, as a result of which the Borden government was sustained by a decisive majority. Premier Borden was one of the overseas members of the Imperial War Cabinet which held its first meeting in London on March 20, 1917, and he was also a delegate to the Peace Conference which met in Paris in January, 1919. See CANADA, subhead *History;* WILFRID, SIR LAURIER.

BORE, a form of tide wave that is seen at spring tide in the estuaries of rivers or in narrow bays. Because of the shape of the estuary the rising waters are piled up as they pass the narrowing shores, and the tide reaches an abnormal height. Bores in the Bay of Fundy sometimes reach a height of sixty feet. The current of a bore is so strong that vessels are often unable to make headway against it. See TIDES.

BO'REAS, in classic mythology, one of the six sons of Aeolus, god of the winds. Boreas, who typified the north wind, was shut up in a cave with his five brothers, and only occasionally were they given their freedom. When the gods desired it, or when Aeolus considered that the boys needed exercise, he released them for a period, during which they tore roofs from houses, uprooted trees and piled the sea mountain-high. The name *Boreas* is often used as a symbol for a boisterous north wind. See AEOLUS.

BORGHESE, *bawr ga'ze*, a Roman family, originally of Siena, where it held the highest offices after the middle of the fifteenth century. CAMILLO BORGHESE (1550–1621), who ascended the Papal throne in 1605 as Paul V, was a prominent member of the family. Another CAMILLO BORGHESE (see below) was a brother-in-law of Napoleon.

BORGHESE PALACE, a magnificent building situated in the midst of the grounds of the beautiful villa Borghese just beyond the walls of Rome. Most of the art collection, consisting of ancient sculpture and painting, belonged originally to the Borghese family of Rome, but was taken to Paris by Napoleon, so that most of the works now contained in the Casino, the name of the building in the villa Borghese, have been gathered together since 1820. The villa and Casino have been purchased by the Italian government and are open to the public. Among the especially noteworthy works of sculpture there are Bernini's *David* and *Apollo and Daphne.* Among the paintings are Domenichino's *Cumaean Sibyl,* Correggio's *Danae,* Titian's *Sacred and Profane Love* and Raphael's *Entombment,* besides masterpieces of many other great painters.

BORGIA, *bor'ja,* the name of an Italian family which came into prominence in the fifteenth century.

Caesar Borgia (1457–1507), son of Rodrigo Borgia, who became Pope as Alexander VI, was a cardinal and military leader. By force and by treachery he gained control of the cities of Romagna and endeavored to form an independent hereditary power in central Italy. He was killed while accompanying the king of Navarre in his war against Castile. Though unscrupulous and cruel, Caesar possessed many redeeming qualities. He was a patron of learning, a brave soldier, a shrewd statesman and an eloquent speaker. Machiavelli holds him up as the type of a model ruler.

Lucretia Borgia (1480–1520), Duchess of Ferrara, and a sister of Caesar Borgia, was a woman of great beauty and intellectual brilliancy, a patron of learning and the arts. In literature her name was long associated with the grossest crimes, but recent researches of accurate and impartial historians have cleared her memory of the worst charges brought against her.

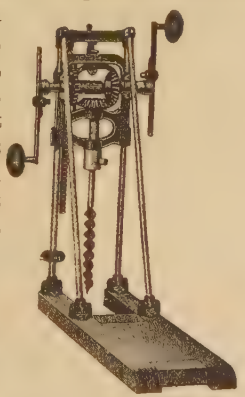
BORGLUM, *bawr'glum,* GUTZON (1867–), an American sculptor whose work represents an admirable blending of technique, vivid imaginative power and idealism. He is a product of the West, for he was born in Idaho and received his public school and college education in Nebraska and Kansas. Borglum studied art in San Francisco and in Paris, and previous to 1902 successfully exhibited examples of his work in sculpture and painting in Paris and London. Since that date he has resided in New York. Representative of his best work are *Mares of Diomedes* in the Metropolitan Museum,

New York; a series of statues in the Cathedral of Saint John the Divine; a bas-relief for the building of the Bureau of American Republics; and a colossal head of Lincoln in the rotunda of the national Capitol. In the English cities of Leeds and Manchester may be seen examples of his work as a painter.

Borglum received his most ambitious commission in 1915, when he was chosen to direct the project of a Confederate memorial, consisting of a colossal carving on the face of Stone Mountain, near Atlanta, Ga. (see STONE MOUNTAIN). It was planned to have the memorial completed in 1924. The work of this sculptor is definitely original, but it shows the influence of the great French genius, Rodin.

In 1918 Borglum came prominently into notice in connection with the American aeroplane investigation, having submitted a personal report to the President which was resented in other official quarters.

BORIC ACID, or **BORACIC**, *bor as'ik*, **ACID**, a compound of the element boron with hydrogen and oxygen. The chief use of the acid is as a source of borax, the biborate of sodium. Boric acid is found as a salty deposit in some volcanic regions, is a part of many minerals and is contained in the steam which, along with sulphurous vapor, issues from cracks in the soil in Tuscany. The steam from these places is now an important source of the acid, a system of condensation and evaporation being employed. The acid forms white, shining, scaly crystals, which, on heating, melt into a transparent mass that when cooled resembles glass. It dissolves in water and has a slight acid taste; it colors blue litmus purple, and yellow turmeric, brown.



BORING MACHINE

BOR'ING MACHINES, machines for piercing wood, leather, metal and rock. The simplest tools for piercing wood are awls, gimlets and augers. The auger used with a brace or bit-stock is usually called a *bit*. The tools used for piercing stone and metal are called drills. The simplest boring machines are operated by hand, either by means of a handle or brace, as in case of the auger, or by driving upon the tool with a hammer, as with a drill; but nearly all boring is now done by machines operated by steam or compressed air. These machines work very rapidly and with great power. The most effective is the diamond drill, used in boring rock. This consists of a hollow tube having black diamond teeth at one end. The drill works with a rotary motion and cuts around a circular piece of rock which forms the core. On account of the hardness of the teeth, the drill will withstand great pressure and sinks into the rock rapidly. See PNEUMATIC TOOLS.

BORNEO, *bawr'ne o*, the largest island in the East Indian Archipelago, and third in size in the world. The Equator passes through it about midway. It is separated from Indo-China, northwest, and the Philippines, northeast, by the China Sea; from Java, southeast, and Sumatra, southwest, by the Java Sea, and from the Celebes Islands to the east, by Macassar Strait. It has an area of 289,496 square miles, nearly half that of Alaska. The island is mountainous and is rich in gold, quicksilver, copper, sulphur, tin and mineral oils. An inferior yellow diamond also is found. The highest peak is 13,698 feet above sea-level. There are numerous navigable rivers, which are the only transportation routes of commerce.

The lowlands, because of the humidity and heat, are unhealthful but fertile, producing cotton, tobacco, spices, sugar cane, potatoes and numerous tropical fruits. Important indigenous trees are the sago palm, valuable as a food producer, and teak and other timber trees. The island is adorned with innumerable wild flowers, and it teems with animal life. Monkeys and birds abound. The chief beast of burden is a small buffalo. Horses are rare, and only the rich natives and European residents can afford them. The native inhabitants of Borneo are Mohammedan Malays and Bugis, in the southern part, and Sulus, in the northern. The least civilized are the Dyaks (which see), occupying the interior. On and near the rivers and coasts trading and seafaring are the people's chief pursuits, while in the mountains there is considerable mining, done principally by immigrant Chinese, and in the lowlands, extensive farming. Population, 1,700,000; only a few thousand are white.

BO'RON, one of the chemical elements, not found native but occurring commonly in combinations, such as borax and sassolite. It was isolated in 1808 in France, and in 1809 in England by Sir Humphry Davy. See BORIC ACID; BORAX.

BOSNA-SERAI, *bos'na sa ri'*. See SARAJEVO.

BOSNIA, *boz'ni a*, until the latter part of 1918 the southernmost province of Austria. As the end of the World War approached and the dissolution of Austria-Hungary became certain, the different nationalities of the dual monarchy established governments of their own, and Bosnia was tentatively included in the new Jugo-Slavic state (see JUGO-SLAVIA). The province, which includes Herzegovina, lies west of Serbia and Montenegro, east of Dalmatia and south of Croatia and Slavonia. It has an area of 19,768 square miles; its population in 1910 was 1,931,802.

Agriculture is the direct support of nearly nine-tenths of the Bosnians. Tobacco, sugar beets, corn, wheat, oats, barley, rye and potatoes are the staple products. Iron, manganese, salt and coal are the leading mineral resources. The language of the Bosnians, called "Bosnisch," is almost identical with the Serbian, and in their manners and customs the people show their relationship to the Serbs. Sarajevo, the chief city and capital, was the scene of the assassination of the heir to the Austrian throne (June 28, 1914), the event which precipitated the World War. In 1910 the city had a population of 51,919.

Bosnia was a part of the Roman provinces of Dalmatia and Pannonia. The Slavs succeeded the Goths in the sixth century, each small section having its own petty ruler. During the Middle Ages it was possessed in turn by Serbia, Croatia and Hungary. In 1376 Bosnia was proclaimed an independent kingdom, and remained so until 1463, when the Turks conquered it and made it thoroughly Mohammedan in religion. At the close of the Russo-Turkish War of 1877–1878 it became an Austrian protectorate, by decree of the Congress of Berlin, and in 1908 was annexed to Austria-Hungary. For years preceding the World War it was a center of pro-Slavic and anti-Austrian agitation.

Related Articles. Consult the following titles for additional information:

Austria-Hungary
Berlin, Congress of
Sarajevo
World War

BOS'PORUS, the strait connecting the Black Sea with the Sea of Marmora and separating that which previous to 1919 was Turkey in Europe from Turkey in Asia. It is nineteen miles long and from one-half to two miles wide. The Strait is an important commercial route and in peace times is frequented by the vessels of all nations. It is strongly fortified, and in 1841 the European powers entered into an agreement that no ships of war should pass through it without the consent of Turkey. During the World War the Bosporus was of great strategic value to the Turks, as it rendered Constantinople safe from attack by water. After the war it became again a highway for all the nations.

Over the middle of the channel (about 3,000 feet wide) Darius constructed a bridge of boats on his Scythian expedition (see CONSTANTINOPLE). The *Cimmerian Bosporus* was the name given by the ancients to the strait that leads from the Black Sea into the Sea of Azov. The Bosporus of Constantinople is called the Thracian Bosporus, to distinguish it from the Cimmerian Bosporus.

The Old State House

BOSTON, MASS., the capital of the state and the county seat of Suffolk County, is the largest city in New England, the fifth largest in the United States, and one of the oldest and most interesting municipalities in America. It is popularly called "The Hub," a name which has its origin in a few lines from Holmes's *Autocrat of the Breakfast Table:*

"Boston State House is the hub of the solar system. You couldn't pry that out of a Boston man if you had the tire of all creation straightened out for a crowbar."

Traditionally, Boston is in one very important sense a "hub," for it has long borne the reputation of being the country's center of culture, "the Athens of America," and many arguments can be presented in support of its claim to this title. In a Boston suburb was established the first college planted on American soil—Harvard—and in or near the city Longfellow, Lowell, Holmes, Hawthorne, Emerson, Parkman,

Henry James and many other literary men lived and wrote at some time in their careers. All of the fine arts—literature, music, painting, etc.,—have flourished in the friendly atmosphere of this city, and its libraries, schools and museums rank with the best in America.

Situation and Plan. Boston is 232 miles northeast of New York, on a beautiful harbor formed by an indentation of Massachusetts Bay. Two rivers—the Charles and the Mystic—find an outlet in this harbor; the latter bounds the city on the north. The original site of the city was a peninsula of 783 acres, with irregular shores and surrounding marshes, which was joined to the mainland by a tongue of land so low that at times the tide submerged it. In the nineteenth century the inlets, marshes and "Back Bay" district were filled in, and the peninsula was thereby enlarged to 1,829 acres. The Back Bay district, now the most exclusive residence section of Boston, was originally an inner harbor formed by the mouth of the Charles River. At the present time the city proper covers an area of about 47.3 square miles, but as it is surrounded on all the land sides by beautiful and populous suburbs, it is the center of a metropolitan district much greater in extent than the area defined by the corporate limits.

The old business section, in the northern part of the city, is closely built and somewhat confusing to the stranger, because of its many narrow, winding streets. Some of these are seemingly the successors of the pioneer trails, and have no particular direction. Washington Street, though it is the principal thoroughfare in the section of the retail stores, is so narrow that when it is crowded there is an overflow of shoppers from the sidewalks into the street itself. Tremont Street, which skirts the Common (see *Parks and Boulevards,* below), is another important thoroughfare in the retail district, while State Street is the financial center, corresponding to Wall Street of New York.

The western section of Boston, extending to Brookline, which is reputed to be the richest suburb in the world, is a fashionable residence district. It is bounded on the west by the basin of the Charles River and on the east by Boylston Street. To the north and east lies East Boston, connected with the business portion by ferry and a double-track tunnel. The section called Charlestown which lies north of the Charles, is noted as the site of the Boston navy yard and the Bunker Hill Monument. Across the Charles River to the west is the suburb of Cambridge noted as the seat of Harvard University. All of the principal streets of the city, as well as its numerous subdivisions, are connected by street car lines, and a subway and elevated railway extend through the most crowded portions of the business section.

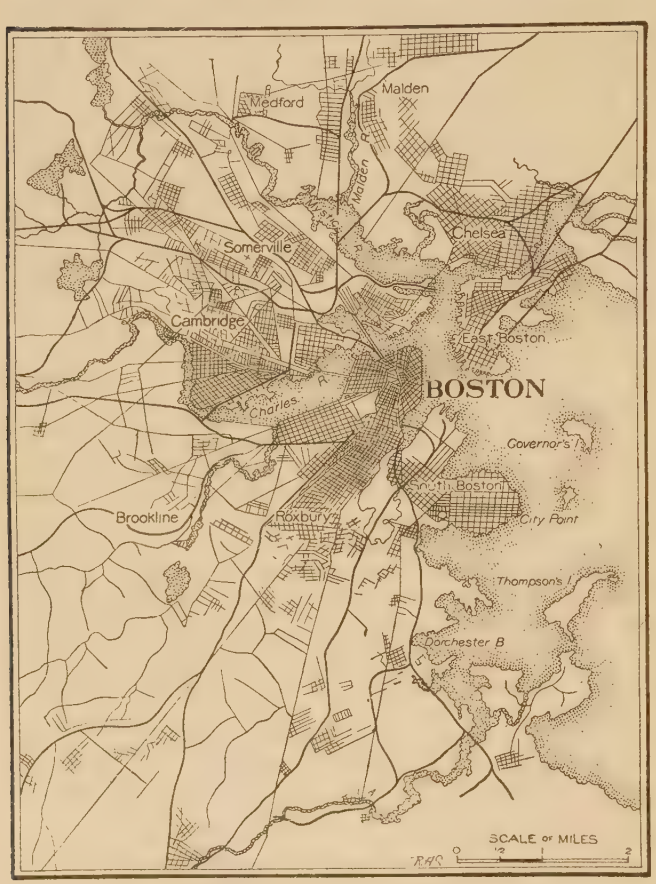
Parks and Boulevards. Of all the parks, the Common is of the greatest interest, on account of its historic associations and its location in the heart of the city. This is an irregular shaped park of less than fifty acres. It is the oldest public park in America and has been used as a pleasure ground since the first settlements were made in and about Boston. Within the Common are found the Soldiers' and Sailors' Monument, the monument to the soldiers who fell in the Boston Massacre (see BOSTON MASSACRE), and the Shaw Memorial, one of the most beautiful monuments in America.

Directly south of the Common is the Public Garden, having an area of twenty-four acres, laid out with walks and flower plots and with a pond in the center. At the Arlington Street entrance stands the colossal equestrian statue of Washington, considered to be one of the six great equestrian statues of the world. There are also several other statues, including one of Edward Everett and one of Charles Sumner. Extending from the Public Garden into the fashionable Back Bay district is Commonwealth Avenue, the finest boulevard in the city. It is 240 feet wide, and through the center there runs a parkway beautified by trees, walks and statuary. On both sides of the boulevard are handsome residences and apartment houses.

The parks mentioned are a part of the park system of Boston proper, but they are connected by boulevard with an outer, or metropolitan, system which includes fully 10,000 acres within a radius of ten or twelve miles. Among the outer parks are the Middlesex Fells, still showing in places their virgin loveliness, and the Blue Hill Reservation, a section of beautiful hill country.

Historic Places. Among the interesting historic structures, the Old Statehouse, on Washington Street at the head of State, is perhaps the most important. The present

structure was built in 1748, and it has served in turn as townhouse, courthouse, statehouse and city hall. Within this building were enacted many of the scenes closely related to those events which led to American independence. King's Chapel, at the corner of Tremont and School streets, was established in 1689, and the present structure was completed in 1753. This was the church attended by the royal governors and other officers of the crown during the colonial period. Christ Church, which is probably the Old North



BOSTON AND VICINITY

Church of Longfellow's *Paul Revere's Ride*, stands at the north end of Salem Street. It was from the belfry of this church that the signal lanterns were hung which notified Paul Revere of the march of the British. The Old South Meeting House, at the corner of Washington and Milk streets, is one of the most noted historic structures in America (see OLD SOUTH MEETING HOUSE). Faneuil Hall, often known as the "Cradle of Liberty," was first built as a market house (see FANEUIL HALL).

Associated with some of the older buildings and streets are a number of burying grounds of great historic interest. Among these are King's Chapel Burying Ground, containing many quaint old gravestones and the remains of some of the most noted of the early colonists, among them Governor John Winthrop and his son and grandson, the wife of Governor Andros, and John Cotton. Copp's Hill Burying Ground was the second burial place established within the town. It contains the graves of Increase, Cotton and Samuel Mather, Chief Justice Parker and many who were noted for the part they took in the Revolutionary struggle. The Old Granary Burying Ground, on the north side of Tremont Street, between Park and Beacon, is also one of great interest. It contains the remains of many distinguished persons, among them Paul Revere, the Hancock family and Samuel Adams.

Public Buildings. The most prominent of buildings which have either been enlarged or modernized is the Statehouse, occupying the summit of Beacon Hill near the center of the city, and noted for its immense gilded dome. The Statehouse extension, begun in 1890, is of yellow brick with trimmings of white marble, and maintains the old colonial style of architecture. The grounds about the building are beautifully kept and contain a number of monuments of historic interest. Other buildings of note are the city hall, the county courthouse, the Federal building, the customhouse, Boston Athenaeum, the North and South railway passenger stations, and numerous imposing business blocks.

The finest architectural center in the city is Copley Square, about which are grouped the public library, Trinity Church and the

new Old South Church. These, with the Roman Catholic Cathedral of the Holy Cross, the First Spiritual Temple (Spiritualist) and the First Church of Christ (Scientist) are among the most prominent church edifices in New England. Among the theaters is the Boston, with a seating capacity of 3,000, the largest playhouse in New England. The Castle Square, the Colonial, the Hollis, the Cort, the Tremont, the Plymouth, the Wilbur, the Majestic and Keith's are also noted playhouses. Symphony Hall, which is occupied by the Boston Symphony Orchestra for its concerts, is one of the finest music halls in the country. Another stately edifice is the new Opera House, in the Fenway district.

Public Institutions. Boston has many public institutions. First among these is the public library, housed in its magnificent new building on Copley Square. The building is of Milford granite, is rectangular in form and surrounds a court containing a fountain and other beautiful appointments. The interior is noted for its architectural and mural decorations, the latter including Abbey's masterpiece, *The Holy Grail.* This library has the largest circulation of any library of its kind the world over, and its collection on Shakespeare and that on music are unsurpassed. Among other important libraries are that of the Boston Athenaeum, with 250,000 volumes, and the Boston Medical Library, with 80,000.

Boston offers exceptional facilities to the student. Its excellent public school system is supplemented by a wide variety of higher educational institutions. Among these are the Boston University, Boston College, Simmons College (for women), the medical school of Tufts College and the medical and dental schools of Harvard University. "Boston Tech," as the famous Massachusetts Institute of Technology is popularly called, has since 1916 been located in Cambridge, on the Charles River. The Boston Latin School (founded in 1635) and the English High School occupy the largest school edifice in America. In the city, too, are the New England Conservatory of Music, with 3,000 students, the Massachusetts Normal Art School and the Lowell School of Design.

Boston has not failed to provide for those who need special help. The Perkins Institution for the Blind, located here, is the best school of its kind in the United States. There are a number of excellent hospitals and all the charitable institutions needed by a city of Boston's rank. Most of the penal institutions are located on islands in the harbor.

Commerce and Industry. Boston is the commercial and financial center of New England, and is second to New York among American ports in amount of foreign trade. In normal years this has an aggregate value of about $200,000,000. As a wool and fish port it ranks second to London. The exports include meat and other food products, leather, cotton and woolen goods and iron and steel products, and the imports include wool, hides, sugar, drugs, fish and rubber. Manufacturing increased at a marked rate during the nineteenth century, and now the city's output has an annual value of about $250,000,000 in normal times. Among the leading manufactures are refined sugar, boots and shoes, clothing, pianos and the exports already enumerated. Shipbuilding is an industry of great and increasing proportions; during the World War Boston became one of the foremost shipbuilding centers of the country.

Boston has a large and well-protected harbor, which has been improved by the construction of immense docks; America's entrance into the World War greatly stimulated the development of the harbor facilities. New construction was inaugurated which made the city a landing place and embarkation point for Pershing's "bridge of ships," and a war port of first importance. The largest drydock on the Atlantic coast, in South Boston, was completed in 1918.

To take care of its domestic trade the city has made adequate provision. The Boston & Maine, the New York, New Haven & Hartford, the Boston & Albany and some smaller roads make Boston their terminal, and on the water front have been erected two great stations—the North and the South stations. The latter, which covers thirteen acres, is one of the largest in the world.

People. Though Boston is popularly supposed to be the home of the oldest American families, and a center of native American stock, in reality it has a very large proportion of foreign-born inhabitants. In 1910, when the population was 670,585, there was a foreign-born percentage of 39.5; only 23.5 per cent were of pure American stock. The

Questions on Boston

(An outline which can be used as a type for any city of the size of Boston accompanies the article City.)

Where did its popular name, "The Hub," originate?

Why is Boston sometimes called "the Athens of America"?

What is the Back Bay district?

Why is it difficult to keep your sense of direction in Boston's business section?

How far is Boston from New York? From Springfield, Mass.?

What reputation does Brookline enjoy? For what is Cambridge noted?

What is the oldest pleasure park in America?

What Boston park possesses a famous equestrian statue of Washington?

Name six famous Americans buried in Boston.

Why is Faneuil Hall called the "Cradle of Liberty"?

In what church did Paul Revere's friend hang the lanterns that served as a signal?

What is the most conspicuous feature of the Boston Statehouse?

What masterpiece among mural paintings hangs in the Boston Public Library?

What claim has Boston to its reputation as an educational center?

How does Boston compare with New York as a port? With London?

What nationality in Boston has the highest percentage of the total population?

What has been the city's increase in population since the outbreak of the Revolutionary War?

Describe the city's most beautiful boulevard. What two park systems do the boulevards connect?

Where did the name Tremont originate?

What does Bunker Hill Monument commemorate? Who paid for it?

In what year was part of Boston destroyed by fire? What other American city was nearly wiped out the year previous?

Irish predominate among the foreign element, representing about one-fourth of the total population. The other foreign nationalities include the English, Scotch, German, Italian and Russian-Jew. In 1917, according to a Federal estimate, the population was 767,813.

History. No one can appreciate or understand early American history without knowing the part that Boston played in the young nation's annals. In the year 1614 Captain John Smith had sailed into Boston Harbor, but the city's real history began in 1630, when a band of colonists under John Winthrop moved over to the peninsula from Charlestown. The peninsula was then called *Trimountaine,* from its three hills—Beacon (the present site of the Statehouse), Copp's, and Fort (since leveled). In September of the same year Boston was officially adopted as the name of the settlement, in honor of the town in England that had been the home of some of the settlers. Boston became the capital of Massachusetts Bay Colony in 1632, and it speedily developed as its religious and educational center, as well. Every American school boy knows the story of the Boston Tea Party, the Boston Massacre, the Battle of Lexington and the Bunker Hill fight, all of which occurred in Boston or its vicinity as preliminaries to the Revolutionary War. At that time the place had a population of 20,000, and was the center of opposition to England.

After the close of the Revolutionary War, the city advanced rapidly in wealth and prosperity. The first Cunard liner entered its harbor in 1840, and from that time to the Civil War the shipping industries were very important. Boston was one of the leading centers in the anti-slavery movement, and during the Civil War its citizens stood staunchly by the Union and furnished their full quota of men for the army and navy. Several disastrous fires have visited the city, the most noted being that of 1872, which laid waste fifty acres in the business section. The burnt district was immediately rebuilt on greatly improved plans. Since 1875 the city has grown rapidly, and in the progress many of the old historic structures have been removed to make room for larger and more modern buildings. Recent years have witnessed the construction of a subway, a large dam across the mouth of the Charles and comprehensive harbor improvements.

BOSTON MAS'SACRE, an affray between a mob of Boston citizens and a squad of seven British soldiers, which occurred on March 5, 1770. It was the result of the violent opposition of the Bostonians to the stationing of British regulars in the city in time of peace. The affray took place on King, now State, Street, and resulted in the killing of three and the wounding of seven citizens. The soldiers who were responsible were tried for murder and were defended by John Adams and Josiah Quincy and acquitted. The garrison, however, was removed to Castle Island.

BOSTON TEA PARTY, the name given to a raid on English tea ships by a body of Boston citizens, December 16, 1773. It resulted from the opposition of the colonies to the imposition of a parliamentary tax upon tea. When ships were sent by the English East India Company to various ports in the colonies, the Americans took vigorous action to prevent the collection of the duty. In Boston a body of citizens, disguised as Indians, boarded the vessels and threw 342 chests of Indian tea into the harbor. The story of the "tea party" is one of the famous true tales of the Revolutionary period.

BOSTON UNIVERSITY, a coeducational institution established in Boston, Mass., in 1869, under the auspices of the Methodist Episcopal Church. The university includes both college and graduate departments. It has schools of theology, law, medicine and science, and provides postgraduate work in science, language, history and philosophy. The agricultural college is allied with the Massachusetts Agricultural College at Amherst. There are about 230 professors and instructors on the faculty, and the institution has about 3,400 students.

BOSWELL, *boz'wel*, JAMES (1740–1795), the friend of Dr. Johnson, whose life of that distinguished writer is a masterpiece of biographical writing. During all the time he was with Johnson, Boswell occupied himself with noting down every word and action of his famous companion, and his *Life of Samuel Johnson*, which appeared in 1791, is almost universally admitted to be the best piece of biography in English. It is because of this masterly biography that we remember Johnson rather as a man than as a writer. Boswell was educated at Edinburgh and Cambridge and became a member of the Scottish bar. In 1763 he became acquainted with Johnson, whom he had for some time previously greatly admired. During a year's travel on the Continent he became acquainted with Voltaire, Rousseau and Paoli, and through Paoli he became deeply interested in the cause of Corsican independence. In 1773 Boswell was admitted to the famous club of which Johnson, Burke, Goldsmith and Reynolds were members, and later in the same year he accompanied Johnson on a tour to the Scottish highlands and the Hebrides. An account of the excursion appeared in 1785.

BOSWORTH, *boz'wurth*, **FIELD**, BATTLE OF, a great battle fought on the moor two miles south of the English market town of Bosworth, in August, 1485. By this battle the Wars of the Roses were closed, and the Earl of Richmond was made king of England in the place of Richard III, who was killed in the battle. See ROSES, WARS OF THE.

BOTAN'IC GARDEN, a garden in which plants are cultivated for the purpose of scientific study. Until modern times their sole design was the cultivation of medicinal plants. Modern botanical gardens are usually connected with universities or are under government control. In the United States there are many collections of plants, but few bear the name of botanic gardens and none has reached the rank of European establishments. *Conservatory* is a name heard more frequently in America.

The most extensive and best known are the Shaw Gardens of Saint Louis, now known as the Missouri Botanic Gardens, and kept in connection with Washington University; the botanic gardens at Cambridge; the Arnold Arboretum at Brookline, in connection with Harvard University, and the newly established New York Botanical Garden, occupying 250 acres in Bronx Park, New York City. The chief gardens in Great Britain are the Royal Gardens at Kew, near London, and those at Edinburgh, Oxford and Dublin. Of the numerous ones in France, the *Jardin des Plantes* in Paris is the most noteworthy and has probably the largest collection of living plants, including about 15,000 species. Other famous European gardens are located at Bologna, Strassburg, Munich and Leipzig. There is also a very fine garden at Montreal, Canada.

BOTANY, the science of plants. This is the simplest and broadest definition that can be given of one of the most fascinating of studies, but it is too broad to stand without further explanation. Botany deals with the description of plants and their parts, their habits and distribution, their relations to one another and to mankind, and their classification. It therefore covers a multitude of topics and is directly connected with several other sciences, such as chemistry, physical geography, medicine and economics.

The Beginnings of Botany. It is easy to imagine how the science of botany began. Wherever men live there are plants of some kind, and always have been, and men must always have paid more or less attention to them. At first, no doubt, the plants were looked upon just as were the rocks or the clouds or the hills; they were there through no art of man's, and it was not his duty or business to take care of them or develop them. When, without his aid, they produced fruits that might be eaten, he ate them; but he troubled himself little about the plants from which they came. But, naturally, as men grew more and more civilized, they came to take a more intelligent interest in their surroundings, and the differences in the various plants about them drew their attention. Some lost their leaves with the coming on of colder weather, and brought out fresh ones in the spring; some kept the same leaves all the year round; some had flowers, but no fruit; some had most insignificant flowers, but gorgeous fruits. And, besides, they were useful for different things. The stems of some might be eaten, the roots of others, the leaf buds of others; from some, medicines were made.

Perhaps it was this last-mentioned fact which first led students to give serious attention to the study of plants; the beginnings of the science of botany seem to have concerned themselves most with medicinal plants. We know that a Greek writer, Theophrastus, in the fourth century B. C., wrote a treatise called the *History of Plants*, in which he told of about 500 kinds that were useful in healing diseases, and in the first century of the Christian Era, Pliny the Elder described about 1,000 plants, many of which were used as medicines.

It is not strange that these ancient writers, studying the subject, as they were, with a definite end in view, paid little attention to the classification of plants. Indeed, even the merest hint of such classification as modern botanists make would have been impossible for them. Certain plants resembled other plants so much that their relation was evident; but others looked much more like members of entirely different families than they did like certain members of their own family.

In the sixteenth century, when there was a renewed interest in everything, botany shared in the awakening. Books were published in various countries, describing plants and giving really beautiful woodcuts of them; but still the interest was chiefly on the medical side of the science. Gradually more and more definite attempts were made at systematic classification, until the time of Linné, or Linnaeus, in the eighteenth century. Linnaeus is looked upon as the originator of modern systematic botany, and more exact and elaborate classifications grew out of his outlines.

How Plants are Classified. The system of classification now generally adopted separates the vegetable kingdom into two great divisions, the first of which contains four groups, and the latter, two. The following outline indicates the characters of these groups:

I. *Cryptogams*, or spore-producing plants. The plants of this division are classified in the following groups:

1. Myxothallophytes, or slime molds, very small organisms, hardly distinguishable from the lowest orders of the animal kingdom. They are one-celled masses of naked protoplasm, resembling the amoeba.

2. Thallophytes, leafless plants of plainly cellular structure, having no distinction between stem and leaf. Among them are many important groups such as the molds, rusts and yeasts.

3. Bryophytes, small, mosslike plants, living a life of two generations, the first in the form of a plant having stem and leaves, and the second in a spore-bearing capsule attached to the body of the preceding generation.

4. Pteridophytes, the most highly organized of the cryptogams, having true roots and often well developed stems and leaves. The

life of the plant is in two generations, one being in the form of a large plant with leaves, separate from and independent of the earlier generation. The ferns are a good example.

II. *Phanerogams*, or seed-bearing plants. This division is composed of two classes:

1. Gymnosperms, or seed plants with naked ovaries, such as the evergreens.

2. Angiosperms, or seed plants with ovules borne in closed ovaries, living a life of but one generation. There are two subclasses of angiosperms:

(a) Monocotyledons, plants in which the embryo has but one cotyledon. The leaves are usually parallel-veined and entire, and the parts of the flower are generally in threes, never in fives. In perennial plants there are no annual rings of wood.

(b) Dicotyledons, plants in which the embryos have two or more cotyledons. This subclass contains the greater part of the flowering plants. Their stems are composed of bark, wood and pith, and the parts of the flowers are usually in fours or fives.

Botany for Boys and Girls. There are many things about botany which any child can and should learn—things which are as interesting as a story. We have dogs or cats or canaries as pets, and we say that they are interesting because they are alive, they have sense, they do things; but we would never think of saying, "I have a bed of pet pansies," or "I have a lily and a rosebush for pets." And yet, if we study about them, we find that plants, too are alive; they do things, and it almost seems to us sometimes that they have sense.

Did you ever stand in a garden and look at a tall, beautiful white lily? It seems strange, as you look at it, that from the black soil at your feet could come the materials to feed anything so pure and white. And now just look down; there beside the lily grows an ugly weed—a cocklebur. It is dusty and brown, with nothing beautiful about it, and everyone calls it a nuisance and wishes it out of the way. Does it not seem wonderful that those two plants can grow there, in exactly the same ground, within a few inches of each other, and each choose from the soil just the elements it needs to make it what it is? The lily takes up water and food from the ground and turns it into smooth green leaves and beautiful waxy white petals; the cocklebur takes up water and food and turns it into harsh, rough leaves and troublesome burs. Could anything that is really "alive" do more than that?

Weeds. We ourselves would not have to think twice as to which we would choose to look at, the lily or the cocklebur; but if a botanist came into our garden he might turn from the lily we are so proud of and give his attention to the ugly bur. In fact, botanists are particularly interested in weeds, for one reason. No matter whether we have flowers or vegetables growing in our yards, we have to take care of them; a bed of sweet peas will soon die out if the sun beats too hot upon it; a garden bed of tomatoes will soon wither if it is never watered. But weeds are different; they do not need to be watered or shielded from the sun; the earth does not need to be

IS THIS A BEAUTIFUL FLOWER OR A WEED?

loosened up about their roots. And it is just this ability to live in spite of everything which makes weeds interesting to botanists. Did you ever stop to think what makes a weed a weed? One of the flowers we like best is the daisy; if we buy it at a florists we call it a marguerite. In some parts of the United States, and in Canada, there is a weed which the farmers hate, which they call whiteweed; it is almost impossible to get rid of it, and it chokes out other crops if it isn't constantly watched. Our marguerite and the farmers' whiteweed are the same. Any plant

BbotanY

SCOPE AND HISTORY

1. Modern botany deals with plants, their forms and uses. How they breathe, grow and reproduce. Their distribution, classification, relation and value.
2. Theophrastus, 300 B.C., began to write on botany.
3. No scientific study until Linnaeus fixed his system.
4. Darwinian theories have revolutionized earlier beliefs.

TWO GREAT DIVISIONS

I. Cryptogams----Spore-producing Plants.

1. Myxothallophytes or Slime Molds

a. A group of plants of very simple structure.
b. Hardly distinguishable from the lowest order of animals.
c. They are one-celled masses of protoplasm.
d. They live upon rotting wood.
e. At one period of its life the slime mold develops spores. In the process, the form modifies until it closely resembles an amoeba.

2. Thallophytes

a. Leafless plants of plainly cellular structure.
b. No distinction between stem and leaf. Many important groups.
c. Diatom. Singly, invisible to the naked eye. Found in rain troughs, ditches, even in the dust of volcanoes.
d. Lichens. Of a leaf-like thallus, living on the air, composed of algae and fungi. Grow upon rocks and barren soil. Dyes used in chemistry taken from lichens, and they give rise to plants of a higher order.

3. Bryophytes

a. Small moss-like plants, living a life of two generations.
b. In the first it has stem and leaves like a plant.
c. In the second, a spore-producing capsule attached to the body of the first generation.

4. Pteridophytes

a. The most highly organized of the cryptogams. Ferns; club moss.
b. Has true roots, and often well-developed stems and leaves.
c. Its life covers two generations.

II. Phanerogams----Seed-producing Plants.

1. Gymnosperms

a. Coniferae, or Pine family.
b. Called coniferae, or cone-bearing, because of their peculiar fruit.
c. Leaves slender and needle-like.
d. The pollen, distributed by the wind, composed of minute grains which fly about as yellow dust.
e. Cypress, fir, hemlock, larch, pine, spruce, yew.

2. Anglosperms

a. Monocotyledons

1. Plants in which the embryo has but one cotyledon. Grasses, palms, lily family, orchids.
2. Leaves usually parallel-veined and entire.
3. Parts of the flowers generally in threes, never in fives.

b. Dicotyledons

1. Plants in which the embryos have two or more cotyledons.
2. This class contains the greater part of the flowering plants.
3. Stems composed of bark, wood and pith.
4. The parts of the flowers usually in fours and fives.
5. Cruciferae, Leguminosae, Compositae, Labiatae, etc.

FLOWERS

PARTS

1. Calyx.
- a. The outermost circle.
- b. Divided into separate parts -sepals.
- c. Its function: to protect the more delicate parts within.

2. Corolla.
- a. The parts called petals.
- b. Usually bright colored, designed to attract insects and birds.
- c. For the protection of stamens and pistils.

3. Stamens.
- a. The stem or filament.
- b. The anther, a sack at the top.
- c. The pollen. Ripened within the stamen.

4. Pistils.
- a. The innermost organs.
- b. The ovules. Contained in an enlarged chamber. The pollen must be carried to the pistils in order to fertilize the ovules, which thereafter become seeds.
- c. A stem called the style, and a tube, called the stigma.

NATIONAL

1. Canada, Sugar Maple.
2. Egypt, Lotus, one of the oldest of national flowers, sacred to the god Osiris.
3. England, Rose. On the English coat of arms are engraved the English rose, the Scotch thistle and the Irish shamrock.
4. France, Fleur-de-lis.
5. Germany, Kaiserblume, or corn flower.
6. Greece, Blue Violet.
7. India, Lotus. The natives believe that in its bosom Brahma was born.
8. Ireland, Shamrock.
9. Italy, the White Lily.
10. Japan, Chrysanthemum.
11. Mexico, Cactus.
12. Persia, Rose.
13. Scotland, Thistle.
14. Spain, Pomegranate.
15. Switzerland, Edelweiss.
16. United States, Goldenrod.

USES

1. Primary. Production of seeds.

2. Secondary.
- a. Beautifying the earth.
- b. For commercial ends.

VARIATIONS

1. Construction.
- a. In one flower only stamens may be found. The pistils may be in another flower on the same plant. Or, a flower may contain pistils only.
- b. The parts of each circle may be so grown together as to render it impossible to distinguish the circles.

2. Forms.
- a. The meaning of many strange shapes not fully determined.
- b. Forms explained by the way the pollen is carried from stamens to pistils.

3. Colors.
- a. Methods of attracting insects and birds.
- b. Thus the astonishing and attractive irregularities, such as the cactus, prickly pear, passion flower.

STATE

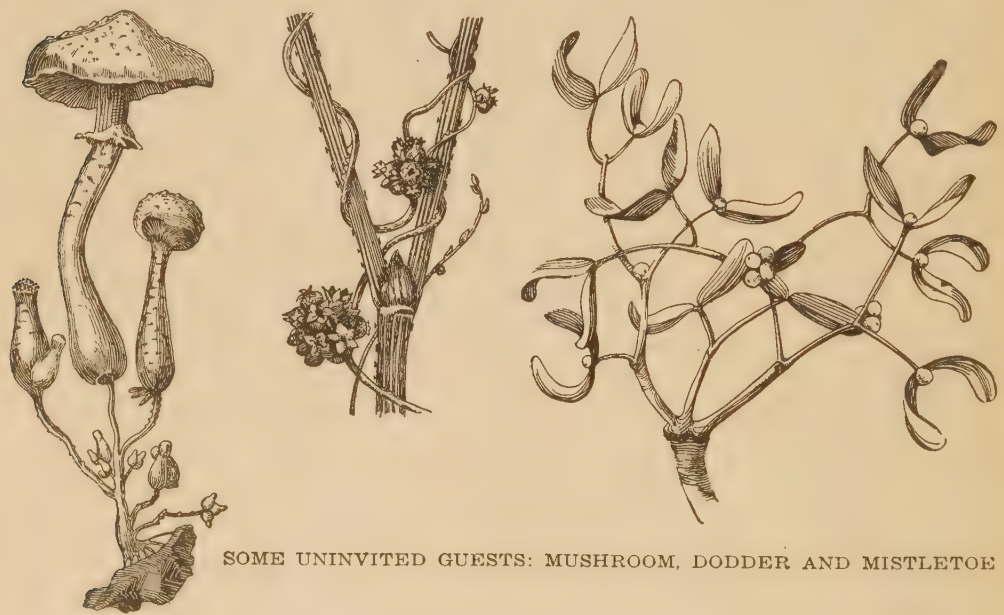
1. Alabama, Sunflower.
2. Arkansas, Apple Blossom.
3. California, Poppy.
4. Colorado, Columbine.
5. Connecticut, Mountain Laurel.
6. Delaware, Peach Blossom.
7. Florida, Orange Blossom.
8. Georgia, Magnolia.
9. Idaho, Syringa.
10. Illinois, Violet.
11. Indiana, Corn.
12. Iowa, Wild Rose.
13. Kansas, Sunflower.
14. Louisiana, Magnolia.
15. Maine, Pine Cone and Tassel.
16. Michigan, Apple Blossom.
17. Minnesota, Moccasin.
18. Mississippi, Magnolia.
19. Missouri, Goldenrod.
20. Montana, Bitter-root.
21. Nebraska, Goldenrod.
22. New York, Rose.
23. North Dakota, Goldenrod.
24. Oklahoma, Mistletoe.
25. Ohio, Carnation.
26. Oregon, Grape.
27. Rhode Island, Violet.
28. South Dakota, Anemone.
29. Tennessee, Daisy.
30. Texas, Bluebonnet.
31. Utah, Sego Lily.
32. Vermont, Red Clover
33. Washington, Rhododendron.
34. West Virginia, Rhododendron.
35. Wyoming, Gentian.

may be a weed if it grows where it is not wanted and becomes troublesome to the farmer or gardener.

Another strange thing about weeds is that many of them which are now looked upon as the worst pests were brought to this country purposely. The tansy, the field-garlic, the ox-eye daisy, the wild carrot are a few of the weeds which we all know which were, for one reason or another, introduced into this country.

Uninvited Guests. There is a word we use often which comes from an old Greek word that meant "eating at another's table"—it is the word *parasite*. Probably at first the word had no unpleasant meaning, but meant any invited or welcome guest. But gradually it came to mean a man who, uninvited and unwelcome, thrust himself upon his host and feed on them. We have all seen such parasites, though probably we have not always recognized them. Have you ever noticed on the top of a jar of preserves or on a crust of bread that has been left in a damp place a furry-looking covering? That is a parasite plant, and it is feeding not on another living plant, but on a plant product. The mildews on leaves and fruits, the wheat rust which so often destroys a wheat crop, the yeast with which your mother makes bread, the mushrooms you eat with your beefsteak, are all parasite plants.

There are others which are more interesting, because they are larger and can be examined more easily. One of these is the dodder. It starts life like any self-supporting plant, with its roots in the ground, but just as soon as it is old enough it begins to send



SOME UNINVITED GUESTS: MUSHROOM, DODDER AND MISTLETOE

stayed and stayed, doing nothing to pay for his keep, but just living off his host. From this the word came to mean anyone who demands and obtains a living from other people without giving anything in exchange for it. You probably think at once of the tramps and able-bodied beggars that you see from time to time, asking for food and money without showing the least willingness to work for it. Now it is not only in the animal world that parasites exist; there are plant parasites—many of them—and they attach themselves to plants which are called their *hosts*, and out little stems, reaching for some host on which it can fasten itself. When the stems find such a plant they twine around it and send little roots down into its stem, to draw away the food which the host plant wants for itself. Then the first ground root dies, and the dodder is left, a parasite for the rest of its life, clinging to another plant.

Some parasite plants are not altogether lazy—they take part of their food from the host plant and make the rest for themselves. Such plants have green or greenish leaves, which a real parasite never does. At Christ-

mas time when we trim our houses with the sturdy holly we put with it the mistletoe, which is a half-parasite. It grows on the branches of trees, down in the southern part of the United States; and often, unless the trees are very strong, the mistletoe must be cut off every year, or else it will steal so much of its host's food that the host will die.

THE PITCHER PLANT AND VENUS'S FLYTRAP
They need insects for food.

Insect-eating Plants. We have talked so far of plants which get their food straight from the soil or from other plants; but there are some strange plants that want another kind of food—animal food. They capture insects, in one way or another, and suck the juice from them. It seems almost uncanny, doesn't it? If you could see a collection of such insect-eating plants you would find that they all have some special means of catching and holding the insects. The pitcher-plant, which you may find in swampy woods, has leaves which are shaped like pitchers, and which usually contain some water. The insects fall into the pitchers, or in some cases enter them in search of the honey which the leaves secrete, and are drowned. They are then partially absorbed by the plant.

The sundew has another way of capturing its food. The leaves are covered with hairs, which give out a sticky liquid. When a small insect touches these sticky hairs he is held fast, and the hairs at once close over him. They remain closed until all the plant wants of the insect has been absorbed, and then they open and allow the undigested part of the insect to drop off. The Venus's flytrap has leaves which are hinged in the middle and which have three short hairs on each side of the hinge. When these hairs are touched by an insect, the two sides of the leaf come together with a snap, and usually the luckless insect is caught. After it has been digested the leaves open and drop out the undigested parts. Do you wonder that we said at the beginning of this talk that some plants seem to have sense?

Plants that Store Food. During the fall the squirrels are very busy running about the woods gathering nuts and carrying them off to some hole in the tree. They gather far more nuts than they can use at

SOME PLANTS THAT STORE FOOD
1. Onion. 2. Turnips. 3. Parsnip. 4. Carrots.

the time, and they store them. Plants, of course, go about the matter differently, but they, too, often manufacture more food than they need and store it up. When you eat potatoes or turnips or carrots or onions, you are eating food which the plants manufactured and stored up. In some cases it is not so easy to see why the food was stored; in other cases it is just as simple as the squirrel's reason for storing up the nuts. The beet, the carrot, the parsnip, the turnip are what is known as *biennial* plants, that is, *two-year* plants. This means that if they are planted one spring they do not go to seed until a year from the following fall. The first year these plants store up food in their roots, and send up above the ground only leaves; the second year they use the food which they had stored to build a tall stem, which bears on its top the flowers and finally the seeds. If you will pull up a carrot that has gone to seed you will find that the root has withered and shriveled—almost all the stored-up food has been used. The

DO YOU SEE MUCH FAMILY RESEMBLANCE?
1. Rose. 2. Apple. 3. Peach 4. Blackberry. 5. Strawberry.

onion acts in much the same way, but in the case of the onion it is a part of the stem, which we call the bulb, in which the food is stored.

Plant Families. Another thing about plants which may seem very strange to us is their family connection. We know that, in the animal world, the cat, the tiger, the panther, the lion all belong to the same family; but there is nothing extraordinary about that. A dog and a wolf look enough alike to be cousins, if not brothers. And so, in the plant world, we should not think it wonderful if we were told that the blackberry and the raspberry belong to the same family, for, indeed, they do. But many of the plant families are very large, and some of the members do not seem to have the least resemblance to each other. We will look at some of these families, examining all the members that we are acquainted with.

THE NIGHTSHADE FAMILY

1. Nightshade. 2. Potato. 3. Jimson weed. 4. Sandbur. 5. Tomato. 6. Petunia.

The first is the lily family—botanists call them the *Liliaceae*. The name is familiar; you know a number of beautiful flowers that bear it. But unless your attention has been called to some of the relatives of the lily, you probably have never suspected them of being relatives. First, there are the tulips and the hyacinths, the dog-tooth violets and the trilliums. Did you ever think when you picked the yellow dog-tooth violets, or the white and red trilliums that they were related to the lilies? But there are stranger members than that in this big family. Out in the fields you have touched at times the wild onion or the field garlic, and you have wished afterward that you had kept away from them, the scent is so unpleasant. Yet those bad-smelling weeds belong to the same family with the lily-of-the-valley and the hyacinth, some of the sweetest flowers that grow.

There is one member of this wonderful family that comes to our table often, and we are usually very glad when it is time for it to come. It doesn't look like a lily in any way, and yet botanists can prove to us by pointing out resemblances that we cannot see, that it does belong to that family. This is the asparagus. Would you ever have believed that it was possible? Some members of this family and also members of the rose family are shown in the color plates in connection with the articles LILY and ROSE.

We have just referred to the rose family. "O yes," you say, "I know that is a big family. There's the moss rose and the tea

rose and the American Beauty and the wild rose and the cinnamon rose, and dozens and scores of others." You are right; it is a big family—bigger than you think. If someone were to ask you whether you could get on without the rose family you might think of all the beauty that would go out of the world with the roses, and you would sigh. But would it occur to you that you could never again have apple pie or cherry pie, that no quince jelly or plum jelly would ever come to your table again; that no luscious strawberries or raspberries or blackberries would ever be heaped up before you, waiting for the sugar and cream; that you would have no velvety peaches or yellow pears, nor even any almonds to crack of a winter's night? It really doesn't seem possible; but it is a scientific fact that all of those fruits do belong to the wonderful family that includes the roses and the sweetbrier and the exquisite bridal-wreath. And there are family resemblances which even we who are not botanists can see. Just take a strawberry blossom or a blackberry blossom or an apple blossom and examine it. Doesn't it, after all look in many ways very much like a wild rose? The petals on the little blossoms are smaller, but they are much the same shape and are placed in much the same way. And it is the wild rose which really represents the roses—all the other beautiful kinds have come from it.

There are other families which seem to us strange; there is the pulse family, which includes the locust, the clover, the acacia, the peas and beans. Look carefully at a red clover blossom; does not one of the tiny flowerets of which it is made up look very much like a sweet pea? If you had before you a yellow buttercup, a blue larkspur, a red peony, a white anemone and a pink hepatica, would you think of them as relatives? They are, and the little buttercup has given its name to the family. The poppy is a big, flaring flower; the bleeding heart is as different from it in shape, size and manner of growth as can well be imagined. And yet these two, with the Dutchman's breeches and the bloodroot make up a part of the poppy family.

We have found out so many strange things about plant relations that perhaps it will not be surprising to learn that the

THE BUTTERCUP FAMILY
1. Hepatica. 2. Anemone. 3. Larkspur. 4. Peony. 5. Buttercup.

THE HEATH FAMILY

1. Huckleberry. 2. Cranberry. 3. Honeysuckle. 4. Rhododendron. 5. Trailing arbutus.

THE POPPY FAMILY

1. Poppy. 2. Dutchman's breeches. 3. Bloodroot. 4. Bleeding heart.

heath family includes, besides the gorgeous rhododendron and the exquisite trailing arbutus, the honeysuckle, the cranberry and the huckleberry. But even these striking discoveries cannot have prepared us for the fact that the nightshade, the sandbur, the jimson weed, the potato, the petunia and

it meant the hard time people have getting enough to live on; but it refers to the animals, and, which interests us more now, to the plants as well. Plants have many things to fight; many things which keep them from becoming as numerous and as thickly spread as they might be. For one thing, the very

THE PULSE FAMILY
1. Locust. 2. Acacia. 3. Beans. 4. Peas. 5. Clover.

the tomato are all relatives. This nightshade family is surely one of the strangest we have found.

Pictures of the members of all of the families described here are to be found on these pages. In some cases, close examination will show resemblances never noticed before; but in many instances the closest scrutiny will fail to make evident any traces of relationship. Do you think it is at all strange that men studied plants for hundreds and hundreds of years before they even began to be able to classify them correctly?

The Scattering of Seeds. See SEED DISPERSAL.

The Struggle for Existence. Did you ever hear anyone speak of the "struggle for existence"? Perhaps if you did you thought

number and millions of little plants are killed off each spring by late frosts.

When you watch cattle and sheep grazing in the fields you are watching some of the strongest plant enemies. Of course in most places the vegetation grows again; but many regions have lost all their plant life because sheep have grazed on them so long. Insects, too—the chinch bug, the locust, various kinds of beetles—destroy whole crops every year.

These are some of the enemies and the unfavorable conditions that plants have to meet. Altogether, the things that destroy plants and the things that help them to grow just about balance each other, so that vegetation is not likely to change very much from year to year. Of course man can make it change; he can plant areas that have been barren, and with care can make them flourishing green

Outline on Botany

I. Plant Physiology
- 1. Chemical composition of plants
- 2. Plant foods
- 3. Movement of water in plants
- 4. Action of chlorophyll (the green coloring matter)
- 5. Digestion and assimilation
- 6. Storing of food

II. The Plant and its Structure
- 1. Cells
- 2. Protoplasm (the substance of which cells are composed)
- 3. Germination
- 4. The root
  - a. Functions
  - b. Classification
    - (1) By manner of growth
      - (a) Soil-roots
      - (b) Aerial roots
      - (c) Water roots
      - (d) Parasitic roots
    - (2) By form
      - (a) Taproot
      - (b) Fascicled (cluster) roots
      - (c) Fibrous roots
  - c. Structure
  - d. Use
- 5. The stem
  - a. Functions
  - b. Classification
    - (1) By direction of growth
    - (2) By manner of development
  - c. Structure
  - d. Use
- 6. The bud
  - a. Structure
  - b. Position
  - c. Kinds of buds
- 7. The leaf
  - a. Arrangement of leaves
  - b. Structure
  - c. Functions
- 8. The flower
  - a. Arrangement
  - b. Parts or organs
    - (1) Calyx
    - (2) Corolla
    - (3) Stamens
    - (4) Pistils
  - c. Reproduction
    - (1) Pollination
      - (a) Self-pollination
      - (b) Cross-pollination
    - (2) Fertilization
    - (3) Reproduction by spores
    - (4) Other methods
- 9. The fruit
  - a. Definition
  - b. Classification
    - (1) Fleshy fruits
    - (2) Dry fruits
    - (3) Aggregate fruits
  - c. Dispersal of seeds

III. The Struggle for Existence
- 1. Overcrowding
- 2. Change of temperature
- 3. Lack of moisture
- 4. Adaptation to conditions

IV. Classification of Plants
- 1. Cryptogams, or spore-plants
  - a. Diatoms
  - b. Fungi
    - (1) Molds
    - (2) Mildews
    - (3) Smuts
    - (4) Rusts
    - (5) Yeast
    - (6) Mushrooms
  - c. Algae, or seaweeds
  - d. Lichens
  - e. Mosses
  - f. Ferns
- 2. Phanerogams (seed plants)
  - a. Gymnosperms (not having a closed ovary)
  - b. Angiosperms (having a closed ovary in which seeds are matured)
    - (1) Monocotyledons (one seed-leaf)
    - (2) Dicotyledons (two seed-leaves)

Questions on Botany

What is the great fact in the life of the flower?

Why is it necessary that birds and insects should be attracted to the flowers? By what means are birds and insects so attracted?

Name and describe a dozen different kinds of flowers of your neighborhood.

What are some of the peculiar shapes of orchids?

What is your state flower?

What is the calyx of a flower?

Why is the corolla usually highly colored?

Where do you find the pollen in the flower and of what use is it?

From what country does the lotus come?

What flower is the emblem of Persia?

What country has the fleur-de-lis for a national flower?

What is the national flower of the United States? How and when was it selected?

What flower is the emblem of Japan?

How are the state flowers adopted?

What is the state flower of West Virginia? Of Louisiana? Of Indiana? Of New York? Of Kansas?

What species of the chrysanthemum are common weeds in Britain?

What is the popular name of geranium?

Where has ivy been held sacred?

What kind of plant is the sundew?

Of what was the myrtle an emblem at Athens?

In what way did Darwin's theories and discoveries revolutionize botany?

What is pollen? Why is it produced in such abundance? How do insects help in the fertilization of flowers?

What are some of the methods by which seeds are scattered?

What are parasites in the plant world? Give examples.

Give uses of the following to plant life: Roots, stems, leaves, flowers.

What is chlorophyll? What important work does it do for the plant?

spots, or he can cut down forests that have stood for centuries.

Have we not found enough interesting facts about plants to show you that there might be much pleasure in studying about them?

Books for Reference. The standard guide to the identification of plants of the region east of the Mississippi River and north of Tennessee is Gray's *Manual of Botany.* Different authors have prepared similar books for the remaining sections of the country. Goodale's *Physiological Botany* is a standard authority on the structure and use of plant organs. The botanies in use in the public schools usually deal largely with the structure and function of plant organs, but many of them contain simple keys and plant descriptions which will enable pupils to identify many of the specimens that come their way. Among the prominent school texts are Atkinson's *Elementary Botany,* Bergen's *Foundations of Botany, Bailey's Botany,* Barnes' *Plant Life* and Coulter's *Plant Relations.* Darwin's *Climbing Plants, Forms of Flowers* and *Insectivorous Plants* are interesting to the more advanced student. In those volumes other references are given.

Related Articles. The list below includes most of the general articles connected with botany, but many of these have special lists, to which the reader is referred.

Air Cells
Air Plants
Alburnum
Algae
Angiosperms
Annuals
Aquatic Plants
Bacteria and Bacteriology
Biennials
Boehmeria
Botanic Garden
Breeding
Bryophytes
Bud
Bulb
Carnivorous Plants
Catkin
Cell
Cellulose
Chlorophyll
Citrus
Colchicum
Composite Family
Coniferae
Cotyledon
Cross Fertilization
Cryptogamous Plants
Cycads
Diatom
Diseases of Plants
Protoplasm
Dyeing
Ecology
Etiolation
Evergreen
Exotic
Ferns
Fiber
Flora
Flowers (with list)
Fruits (with list)
Fungi
Galls
Germination
Grafting
Grains (with list)
Grasses (with list)
Gymnosperms
Herbarium
Herbs (with list)
Leaves
Leguminous Plants
Lichens
Molds
Mosses
Nature Study
Nut (with list)
Osmosis
Parasite
Perennials
Phanerogamous Plants
Plant (with list)
Pollen
Pteridophytes
Puffball
Ranunculus
Roots
Rusts
Sap
Seeds
Seed Dispersal
Spice (with list)
Sport
Spurge Family
Stems
Umbelliferae
Vegetables (with list)
Venation
Weeds (with list)
Yeast